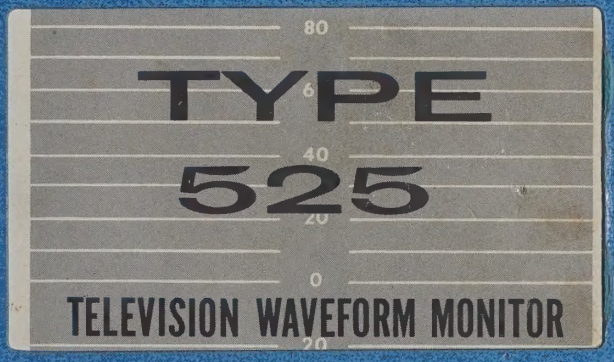
INSTRUCTION MANUAL



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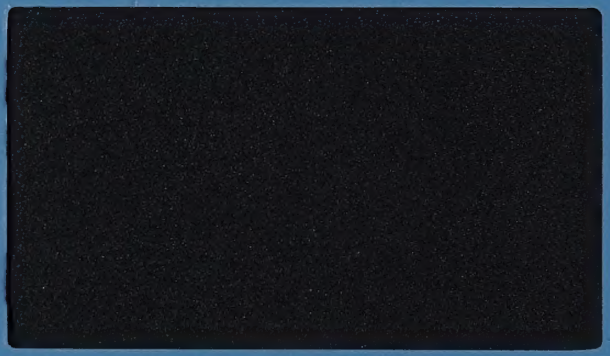

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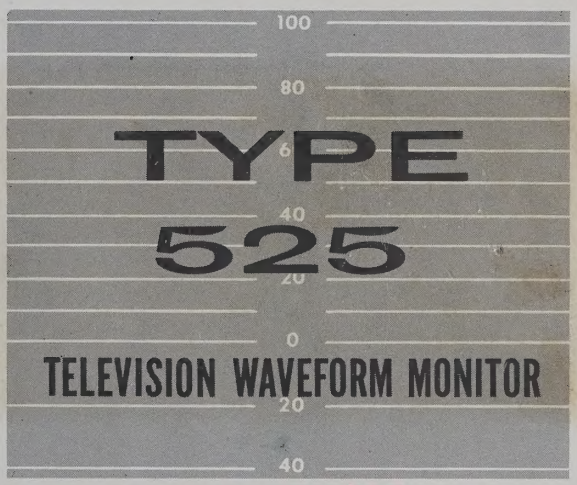

S/N 1846

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S.W. Millikan Way ● P. O. Box 500 ● Beaverton, Oregon ● Phone MI 4-0161 ● Cables: Tektronix

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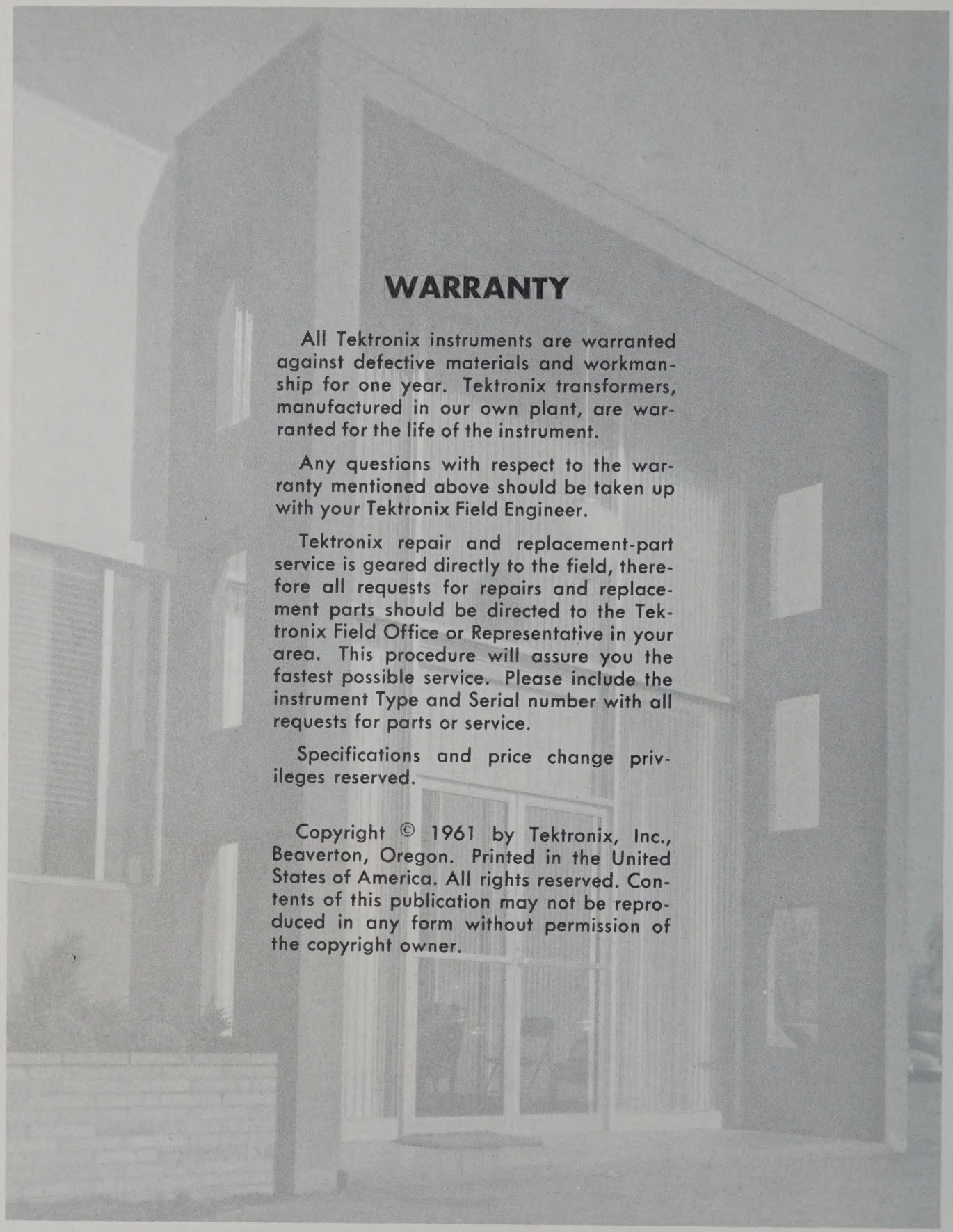

WARRANTY

All Tektronix instruments are warranted against defective materials and workmanship for one year. Tektronix transformers, manufactured in our own plant, are warranted for the life of the instrument.

Any questions with respect to the warranty mentioned above should be taken up with your Tektronix Field Engineer.

Tektronix repair and replacement-part service is geared directly to the field, therefore all requests for repairs and replacement parts should be directed to the Tektronix Field Office or Representative in your area. This procedure will assure you the fastest possible service. Please include the instrument Type and Serial number with all requests for parts or service.

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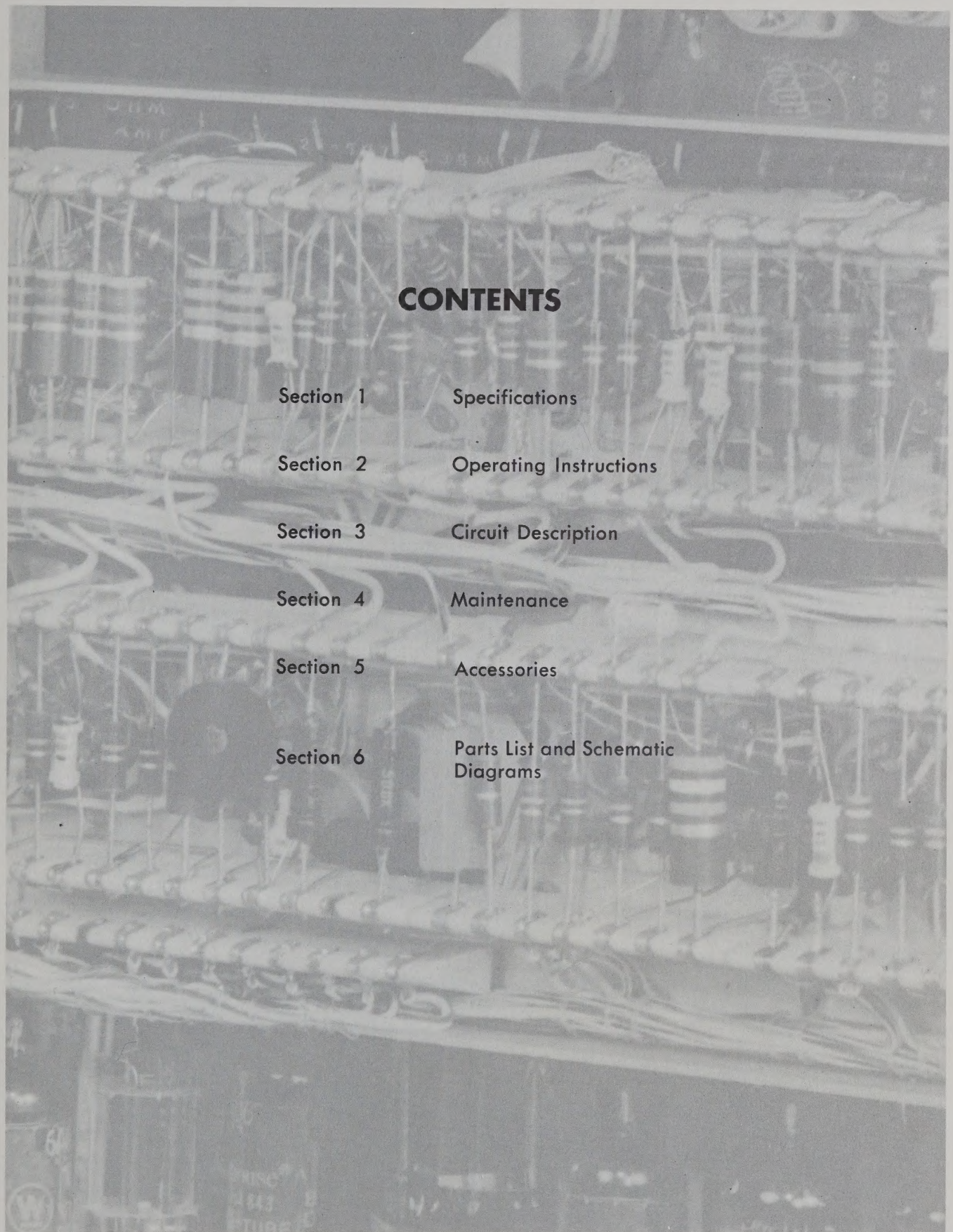

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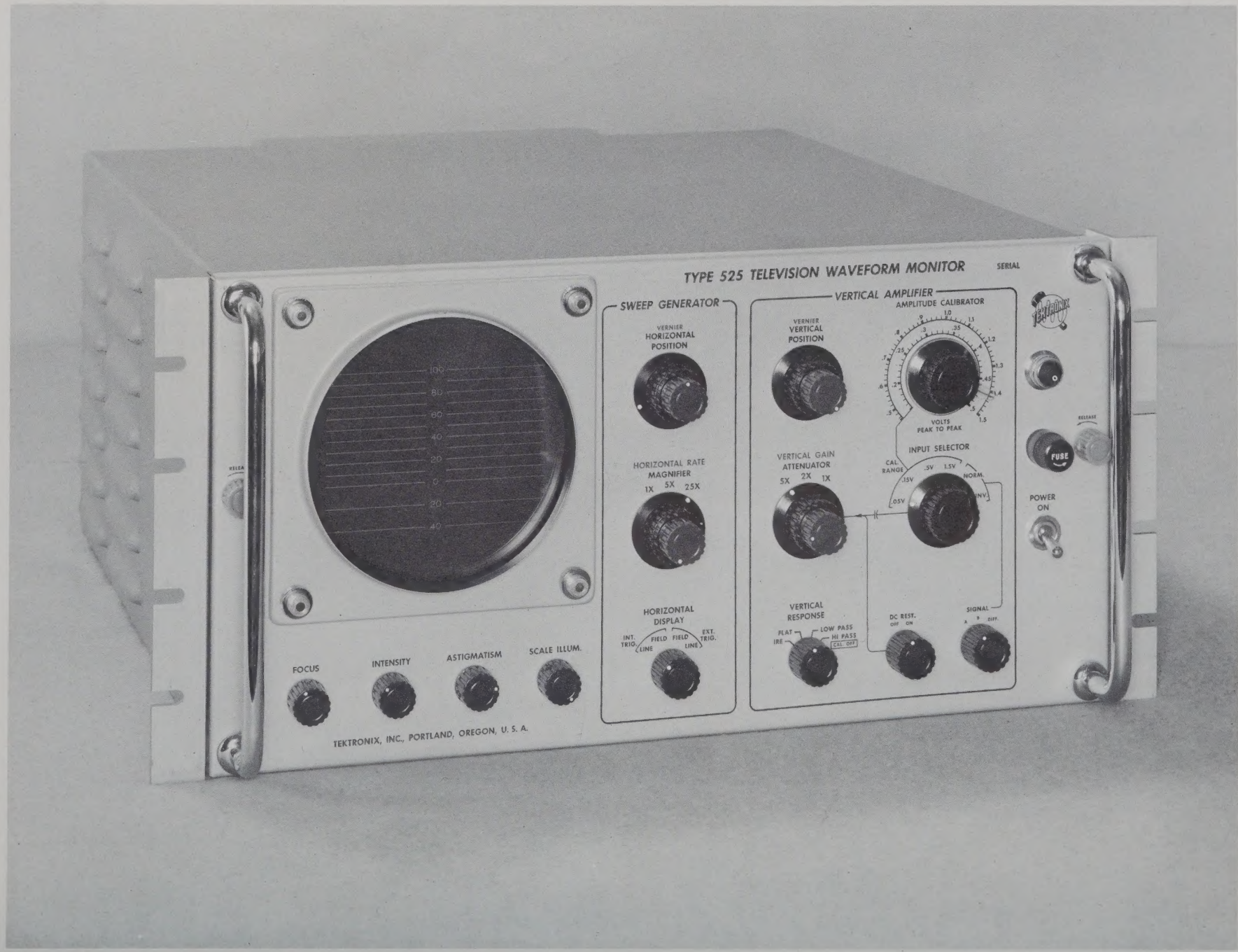
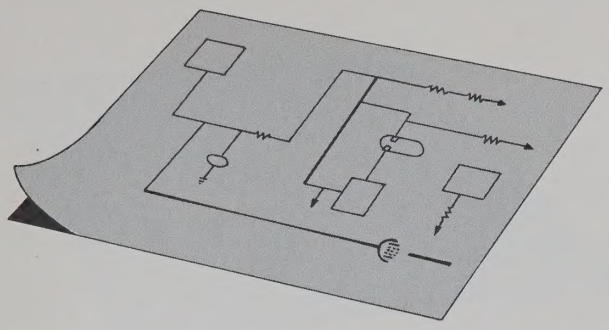

TYPE 525 TELEVISION WAVEFORM MONITOR
SERIAL
SWEEP GENERATOR
VERNIER HORIZONTAL POSITION
HORIZONTAL RATE MAGNIFIER
1X 5X 25X
HORIZONTAL DISPLAY
INT. TRIG.
FIELD
FIELD
EXT. TRIG.
LINE
LINE
VERTICAL AMPLIFIER
VERNIER VERTICAL POSITION
AMPLITUDE CALIBRATOR
VOLTS PEAK TO PEAK
VERTICAL GAIN ATTENUATOR
5X 2X 1X
INPUT SELECTOR
CAL RANGE
.5V
1.5V
NORM.
.15V
INV.
.05V
VERTICAL RESPONSE
FLAT
LOW PASS
IRE
HI PASS
CAL OFF
DC REST.
OFF ON
SIGNAL
A B DIFF.
FUSE
POWER ON
FOCUS
INTENSITY
ASTIGMATISM
SCALE ILLUM.
TEKTRONIX, INC., PORTLAND, OREGON, U. S. A.



SECTION 1

SPECIFICATIONS

General

The Type 525 Television Waveform Monior is a special-purpose cathode-ray oscilloscope, designed to display television-signal waveforms, either standard black-and-white, or color, with the precision required for color television broadcastinig.

It fulfills the exacting demands of the color-television broadcaster to measure and continuously indicate linearity, signal level, and bandwidth, with high accuracy and dependability.

Vertical Deflection System

Deflection Factor — .015 v/cm to .2 v/cm.

Frequency Response

Flat — 60 cycles to 5 mc, ±1%.

IRE — 3 db down at about 1.8 mc.

Low Pass — 3 db down at about 1 mc.

High Pass — Bandpass at 3.6 mc for linearity checks. Down 3 db at about 2.7 mc and 5.2 mc.

Linear Deflection — 6 cm on screen. Portion on screen will remain undistorted for up to 30 cm of deflection in FLAT, IRE and LOW PASS positions of RESPONSE switch.

Step Attenuator — Three positions: 1X, 2X and 5X.

DC Restorer

Keyed clamp type with on-off switch.

Maximum Allowable Combined DC and Peak AC Voltage Input — 600v.

Input Connectors

Two sets of two paralleled connectors each to allow for balanced or single-ended input with the cables terminated or bridged through. Connectors are at the rear of the instrument.

Input Impedance — 75 ohms.

Horizontal Deflection System

Sweep Frequencies

Variable 2625 to 7875 cps when synchronized with line pulses.

Variable 10 to 30 cps when synchronized with field pulses.

Sweep Magnifier

Expands sweep 5 times or 25 times to right and left of screen center.

Unblanking — DC coupled.

Trigger Requirements

Internal — 1 cm of TV sync waveform on screen.

External — .5v sync waveform or square wave. (Higher amplitude required for other waveforms.)

Other Characteristics

Cathode-Ray Tube

Type T52P1

P2, P7 and P11 phosphors optional.

Accelerating Potential — 4200 volts.

Voltage Calibrator

Four ranges from .05 volts to 1.5 volts full scale, continuously variable between ranges and to .015 volts. Accuracy — 2% of full scale. Waveform: Positive pulses at about 20 kc, with approximately 75% duty cycle.

Power Supply

Electronic Regulation

Power Requirements — 105 to 125, or 210 to 250v, 50-60 cycles, 380 watts.

Mechanical Specifications

Ventilation — Filtered, forced air ventilation.

Finish — Photo-etched anodized panel; blue wrinkle cabinet.

Dimensions — 8-23/32" high, 19" wide, 20¾" rack depth, 22¼" overall.

Weight — 54 pounds.

Accessories Included

2—B75R 75-ohm termination blocks, 011-023

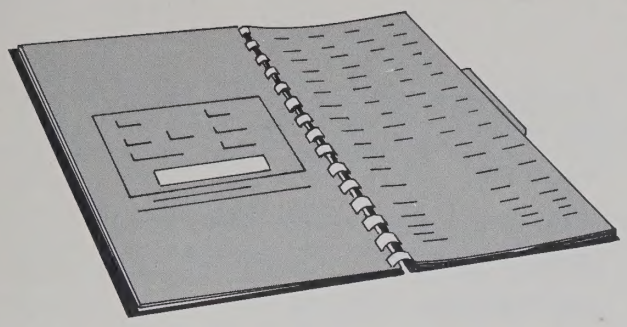
1—F510-5 Green Filter, 378-514

2—Instruction Manuals.

1—3 to 2-wire adapter, 103-013

1—3-conductor power cord, 161-010

NOTES



SECTION 2

OPERATING INSTRUCTIONS

PRELIMINARY INSTRUCTIONS

Mounting

The Type 525 Monitor can be mounted in a standard 19-inch relay rack. It can also be operated on a bench. Provision should be made for power- and signal-cable connections to the rear panel.

Cooling

A fan maintains safe operating temperature by circulating air through a filter and over the rectifiers and other components. The instrument must therefore be placed so the air intake is not blocked. The air filter must be kept clean to permit adequate air circulation. If the interior temperature does rise too high for some reason, a thermal cutout switch will disconnect the power and keep it disconnected until the temperature drops to a safe value.

Cable Connections

Four coax connectors for signal cables are located on the rear panel. Two connectors go to each of the input grids in the DIFF. position of the SIGNAL switch. The cables should be long enough to allow the instrument to be pulled out of the cabinet on the slides with the cables connected.

Connect the input cables to the top connectors, A and B. If the cables are to be bridged through, connect the output cables to the bottom pair of connectors. If the cables terminate at the instrument, connect the 75-ohm termination blocks to the bottom connectors.

FUNCTIONS OF CONTROLS AND CONNECTORS

CRT Controls

FOCUS	Control to adjust the beam for maximum sharpness of the trace.
INTENSITY	Control to vary the brightness of the trace.
ASTIGMATISM	Control used in conjunction with the FOCUS control to adjust the beam for the maximum sharpness of the trace.
SCALE ILLUM.	Control to vary the brightness of the graticule illumination.

Sweep Generator

HORIZONTAL POSITION	Control to position the trace horizontally.
VERNIER (red knob)	Control having less range than the black knob permitting a fine horizontal positioning adjustment.
HORIZONTAL RATE (red knob)	Control to adjust the sweep speed and repetition rate over a four-to-one range.
MAGNIFIER	Three-position switch to select sweep-magnification ratios of 1X, 5X or 25X.
DISPLAY	Four-postition switch to select the trigger source and set the sweep and trigger circuits to operate at field or line frequencies.

Vertical Amplifier

VERTICAL POSITION	Control to position the trace vertically.
VERNIER (red knob)	Control having less range than the black knob permitting a fine vertical positioning adjustment.
VERTICAL GAIN ATTENUATOR	Continuously variable control to adjust the gain of the vertical amplifier. Three-position switch to select compensated attenuators for 5X, 2X or 1X attenuation.

RESPONSE	Four-position switch to select the amplifier frequency response; IRE, FLAT, LOW PASS or HIGH PASS.
SIGNAL SELECTOR	Six-position switch to select the four calibrator ranges or the signal selected by the SIGNAL switch, either normal or inverted.
DC REST	Two-position switch to connect keyed-clamp dc restorer in ON position.
SIGNAL	Three-position switch to select the signal connected to either INPUT A or INPUT B or to select both in the DIFF. position.
AMPLITUDE CALIBRATOR	Continuously variable control to adjust the calibrator voltage over the range selected by the SIGNAL SELECTOR control.
POWER	Two-position switch to turn the power on or off.

Rear Panel

TRIGGER INPUT	Coax connector for a triggering signal.
TRIGGER POLARITY	Two-position switch to invert the triggering signal to provide the proper polarity for the triggering circuits.
INPUT A	Two paralleled coax connectors for input and output cable connections to the SIGNAL switch.
INPUT B	Two paralleled coax connectors to connect a second signal to the monitor or to allow a balanced signal connection.
CRT CATHODE	Binding post to connect a signal to the crt cathode for intensity modulation purposes.

FIRST TIME OPERATION

First get a trace on the screen by the simplest method and then proceed with the presentation you want after you get an idea of the functions of the controls. To get a trace on the screen proceed as follows:

Be sure the POWER switch is turned off. Connect the line cord to a source of power and set the front panel controls as follows:

FOCUS	Center
INTENSITY	Counterclockwise (CCW)
ASTIGMATISM	Center
POWER	ON
HORIZONTAL POSITION	Center
HORIZONTAL RATE (red knob)	CW
MAGNIFIER	1X
DISPLAY	INT. TRIG., LINE
VERTICAL POSITION	Center
VERTICAL GAIN	CW
ATTENUATOR	1X
RESPONSE	FLAT
SIGNAL SELECTOR	.05 V
AMPLITUDE CALIBRATOR	Full Scale

If the tubes have had time to warm up, turn the INTENSITY control clockwise until a trace is visible on the screen. Adjust the FOCUS, ASTIGMATISM and INTENSITY controls to produce a sharp trace of comfortable brightness.

The two POSITION controls will move the trace vertically and horizontally as necessary to position the display where you want it on the screen.

You are now viewing the calibrator waveform, a nonsymmetrical square wave at about 20 kc. To view the television signal it is only necessary to switch the SIGNAL SELECTOR to INPUT and set the SIGNAL switch to select the desired input.

SWEEP OPERATION

Triggering

The triggering circuits are completely automatic in operation. It is only necessary to select the field or line rate and the trigger source with the DISPLAY switch. In the INT. TRIG. positions of the DISPLAY switch, the trigger is derived from the signal fed to the vertical amplifier by the SIGNAL SELECTOR switch. In the EXT. TRIG. positions of the DISPLAY switch, the trigger circuits are connected to the EXTERNAL TRIGGER coax connector on the rear panel. For external trigger signals having positive sync pulses, set the TRIGGER POLARITY switch to +. For negative pulses set it to —.

Repetition Rate

The DISPLAY switch selects the basic sweep repetition rate to correspond with the television-signal line or field repetition rate. In addition the HORIZONTAL RATE control varies the sweep speed so that from one to four lines or fields will be shown on each trace. When more than one line or field is displayed on a single sweep the repetition rate is reduced as required, up to five times.

Magnifier

Two magnifications of the sweep are available which expand the horizontal axis five times or twenty-five times.

The high degree of magnification permits examination of individual horizontal sync pulses. The magnifier changes the gain of the amplifier without affecting the repetition rate.

The magnifier circuits expand the trace each way from screen center regardless of the setting of the HORIZONTAL POSITION controls. The waveform at the center of the screen remains centered permitting quick identification of the magnified portion of the trace.

VERTICAL OPERATION

Response Switch

The RESPONSE switch inserts frequency-compensation networks in the vertical amplifier to provide response characteristics useful in monitoring television signals.

In the IRE position the cutoff frequency is reduced to about 2 mc in accordance with IRE specifications for level measurements. In the FLAT position the amplifier is flat, within 1 per cent between 60 cycles and 5 mc. In the LOW PASS position, the cutoff frequency is reduced to transmit the stair step and eliminate the 3.58 mc component of the linearity test signal. In the HI PASS position the stair step is suppressed but the high frequencies are transmitted for linearity tests. An additional amplifier provides five times more gain when the RESPONSE switch is in the HI PASS position. This additional gain permits full-screen presentation of the 3.58 mc component of the linearity test signal.

In some cases it may be more convenient if the amplifier gain is not increased in the HI PASS position. For this reason there is adequate range in the chassis mounted HI PASS GAIN ADJ. control to reduce the additional gain to one. For detailed instructions see the Maintenance section of this manual.

Calibration

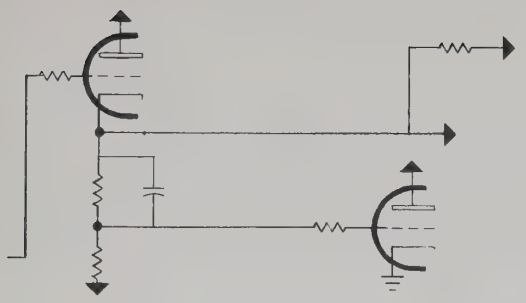
Two methods can be used to determine the amplitude of a signal being examined. The most convenient method is to calibrate the screen for some known deflection factor so that the screen can be read as a voltmeter. Set SIGNAL SELECTOR positions and the AMPLITUDE CALIBRATOR control to one of the calibration marks, preferably near full scale for maximum accuracy. Set the VERTICAL GAIN controls to obtain 5 cm of deflection (100 per cent on the graticule scale). Percentage figures can then be directly converted to peak-to-peak voltages.

For the second method adjust the vertical gain until the signal to be measured exactly fills the graticule or any number of graticule divisions. Then switch the SIGNAL SELECTOR switch to the calibrator and adjust the calibrator controls so that the calibrator waveform has the same amplitude as the signal being measured. The amplitude of the signal can then be read directly from the calibrator controls. The voltage indicated will be peak-to-peak voltage of the waveform.

DC Restorer

A keyed-clamp dc restorer clamps the signal once each line during the sync pulse. The circuit minimizes any hum in the incoming signal and prevents a shift in the base line as the average dc level of the signal changes. To disable the dc restorer circuit turn the DC REST. control to OFF.

NOTES



SECTION 3

CIRCUIT DESCRIPTION

BLOCK DIAGRAM

The block diagram shows the functional circuits of the Type 525 Monitor and the basic direction of signal flow.

The preamp converts the signal for push-pull amplification in the succeeding stages. The push-pull information is then fed through a gated clamp circuit to the vertical amplifier. It is also fed to the sync separator through the trigger inverter. The signal is amplified by the vertical amplifier and applied to the deflection plates of the crt.

The calibrator, a free-running multivibrator, is connected directly to the preamplifier through the INPUT SELECTOR switch.

The sync separator selects the sync pulses from the composite signal and rejects the picture information. The output of this section is the trigger signal that starts the sweep The clamp-pulse generator produces a pulse for the clamp circuit. This pulse causes the vertical display to be clamped during the horizontal sync pulse of the composite signal. The sweep generator is triggered by the output of the sync separator and produces the sweep signal which is fed to the horizontal deflection plates of the crt. The sweep generator also provides a pulse for unblanking the crt.

VERTICAL DEFLECTION SYSTEM

Vertical Preamp

Coaxial connectors are provided at the rear of the instrument for the input signal. There are two connectors in parallel for each of the two inputs. The SIGNAL switch selects either of the two inputs or connects the two inputs simultaneously so the signal can be viewed differentially. The input information is fed from the SIGNAL switch to the INPUT SELECTOR switch. The INPUT SELECTOR switch will invert the signal, if desired, or will insert the calibrated waveform.

The signal is capacitively coupled to the grid of V49. V49 and V50 form a cathode-coupled phase inverter and amplifier. The FIRST STAGE DC BAL control, R12, compensates for the difference in characteristics of the tubes. . With this control set properly, there will be no sudden change in the vertical position when the VERTICAL GAIN ATTENUATOR is switched. The capacitors, C41A & B provide low-frequency compensation for this stage.. The inductors,, L41 and L51, provide high-frequency peaking. The VERTICAL GAIN ATTENUATOR, located between the cathodes of V49 and V50, is calibrated by R47 in the X2 position and by R48 in the X5 position. The inductors, L47 and L49, compensate for stray capacitance to ground and between cathodes.

The signal is dc coupled from the plates of V49 and V50 to the cathode follower, V60, and then capacitively coupled to the amplifiers V85 and V86. L80, L84 and L87 provide high-frequency compensation for this stage of amplification while the capacitors, C83A & B, provide low-frequency compensation. The VERTICAL GAIN control, R80, between the cathodes of these tubes, controls the amount of degeneration in the common-cathode circuit. The signal is dc coupled from the plates of V85 and V86 to cathode followers V95A & B. At this point the signal is connected to the INPUT SELECTOR switch where the polarity selection is accomplished. From the vertical preamp the signal goes to the sync separator and the vertical amplifier.

Vertical Amplifier

The input to the vertical amplifier is fed through the push-pull cathode followers V105A & B. The signal from the cathodes is coupled into the VERTICAL RESPONSE switch. Also connected to this same point on the VERTICAL RESPONSE switch is the clamping circuit consisting of V113 and V114. This circuit clamps each time a pulse is generated by the clamp-pulse generator, V260 and V275, in the sync-separator and trigger-amplifier circuit. We shall now consider one-half of the gated-clamp diodes since both halves of the push-pull circuit are identical.

The two diodes, V113A & B, are connected in series, with the plate of V113A and the cathode of V113B being a common point between the two tubes. This point is dc coupled to the grid of V180A except when the VERTICAL RESPONSE switch is in the HIGH PASS position. Between clamp pulses, V113A & B are cut off and capacitors C119 and C121 charge, through R119 and R121, toward a level determined by the VERTICAL POSITION control, R135. When the clamp pulse is applied, V113A & B conduct, discharging C119 and C121. The common point between V113A & B assumes a potential equal to that applied to the midpoint of R119 and R121, and C105 is charged to this potential. The VERT. POS. RANGE control, R137, allows the balance to be adjusted so the VERTICAL POSITION control has adequate range. The clamping circuit can be disabled at any time by the DC REST. switch.

The VERTICAL RESPONSE switch inserts frequency-sensitive networks to provide four response characteristics. In the HI PASS position, an additional amplifier having from one to five times additional gain is connected into the circuit. This permits full-scale deflection by the 3.6 mc com-

ponent of the linearity step signal. The HI PASS GAIN ADJ. control, R171, determines the additional gain when the VERTICAL RESPONSE switch is in the HI PASS position. This additional gain is adjustable from 1 to 5 times. The clamping circuit has no effect when the HI PASS position is used because of coupling capacitors C151 and C152. Vertical positioning is obtained by varying the dc level applied to the grids of V180 through R175 and R176.

The signal is fed from the VERTICAL RESPONSE switch directly to cathode followers V180A & B, which are coupled to the output amplifiers, V185 and V186. The center-tapped inductor, L191, in the plates of the output amplifiers provides high-frequency compensation. The VERTICAL GAIN SET control, R189, between the cathodes of V180A & B, sets the gain by varying the coupling in the common-cathode circuit. The crt deflection plates connect to the plates of the output amplifiers.

Calibrator

The calibrator consists of an asymmetrical multivibrator operating at about 20 kc. The output of the multivibrator is used to turn cathode follower V30B on and off. The grounded-grid amplifier, V20A, provides isolation and clipping to obtain a clean response, free of overshoot. . The clamp diode, V30A, clamps the output waveform at an amplitude determined by the CAL. ADJ. control, R28. The divider in the cathode of V30B, provides four voltage ranges for the AMPLITUDE CALIBRATOR control, R37. The factory preset CALIBRATOR SCALE ADJUST, R38, provides control for calibrating the lower portion of the AMPLITUDE CALIBRATOR. The calibrator output is connected into the vertical preamp by the INPUT SELECTOR switch.

HORIZONTAL DEFLECTION SYSTEM

Trigger Inverter

The composite signal is coupled to the internal trigger inverter, V210, from V95 in the vertical preamp. DC feedback, from the plate to the grid of V210B, maintains a low average value of plate current in this tube. The sync pulse is positive on the grid of V210B and will cause the tube to conduct. During the remainder of the composite signal, V210B is cut off and V210A acts as a low-gain amplifier with R218 contributing a large amount of degeneration. Thus the sync pulse receives more amplification than the picture information.

Sync Separator

The sync separator, V235A, draws current during the sync pulse charging C230. This charge is sufficient to hold V235 cut off for the time between sync pulses. Thus only the sync pulses will appear at the plate. The plate voltage drops rapidly when V235A conducts but is clamped by V235B at about +120 volts. The signal is differentiated by C235 and the negative going pulse is applied to the grid of cathode follower V245. At the end of the sync pulse the plate voltage again rises to its resting value. The positive-going differentiated pulse is eliminated by diode V241. The low-pass network, R238, C238, R239, and C239, separates the vertical sync pulse and applies it to C240. If the HORIZONTAL DISPLAY switch is in the LINE position, the vertical-sync pulse is by-passed to ground at C240 and the horizontal sync pulse is applied to V245. With the HORIZONTAL DISPLAY switch in the FIELD position, the vertical-sync pulse is applied to V245A through the diode, V241. The capacitor, C245, by-passes the horizontal sync pulse to ground.

Clamp-Pulse Generator

The negative-going signal at the plate of V235A also appears at its screen, but in smaller amplitude. This signal at the screen of V235A is amplified by V260B, acting as a grounded-grid amplifier. The amplified negative-going signal at the plate of V260B is amplitude-limited by germanium diode V264. The signal at the grid of V260A drives it beyond cutoff.

C259 varies the pulse width at the plate of V260A by varying the time V260A is cut off. This capacitor is adjusted at the factory so that the waveform at the junction of R276 and R277 has a 1-μsec width across the top.

The positive pulse at the plate of V260A is amplitude-limited by shaper diode V275A. This shaped pulse is fed into a modified split-load phase inverter V275B. This phase inverter supplies two output pulses simultaneously, which are equal in amplitude and duration but opposite in phase.

Sweep Generator

The sweep generator, V310, is a screen-coupled phantastron. The disconnect diode, V305A, couples the negative-going trigger pulse and disconnects the phantastron from the previous stages during the rundown action.

In the quiescent ccondition, the phantastron plate is clamped at about +170 volts by V305A, the suppressor is biased to plate cutoff with the screen drawing current and the control grid at, or a little below, ground potential. The trigger pulse is coupled from the plate of V310, through the cathode follower, V325B, through C325, to the control grid of V310. This negative-going pulse on the control grid reduces the cathode current. The reduction in cathode current permits the screen grid to rise toward +120 volts. The rise in screen voltage is coupled to the suppressor grid through V315B and C315. The rise in suppressor voltage permits the cathode current to flow to the plate and the plate voltage drops. The decrease in plate voltage is coupled back to the control grid through the timing capacitor, C325. This action is regenerative and the plate voltage will continue to drop until the control grid voltage drops low enough to gain control of the plate current. At this point, the total cathode current has been greatly reduced; the screen has risen to +120 volts where it is clamped by the diodes V320 and V321; and a small plate current is flowing. A small current flows from the cathode of V325B through the timing capacitor and the timing resistors; R318, R319, R320, and R321.

The rate of discharge of the timing capacitor is determined by the timing resistors which maintain an almost constant current flowing through the circuit.. Any deviation in current flow through the circuit will cause a change in voltage drop across the timing resistors changing the level of the control grid. This change is amp'ified by V310 and coupled back through V325B, maintaining a constant rate of discharge of the timing capacitor and therefore a linear rundown. This action continues, the grid rising slightly as the timing capacitor discharges, permitting the plate to take the increasing current required by R310 until the plate bottoms. As the plate bottoms, screen current increases causing the screen voltage to fall. This fall is coupled back to the suppressor reducing p'ate current and causing an increase in plate voltage. This rise in plate voltage is coupled back to the control grid and this action, then, is regenerative, the phantastron reverting back to its quiescent condition. In the absence of a trigger, hold-off capacitor C315 discharges through R305 initiating plate current in V310 allowing the sweep to free-run at a low repetition rate.

The positive-going pulse, at the screen of V310, is utilized for two separate purposes. In the sweep, it is added to the output of the phantastron, eliminating the step at the beginning of the sweep. Secondly, it is coup'ed trhough the cathode follower, V315B, to the crt circuit as an unblanking pulse. The diodes, V320 and V321, clamp the top of the screen waveform at +120 volts shaping the square wave. The diode, V315A, in the suppressor, insures that the suppressor will not be carried so high that it may stick because of the secondary emission, and it still permits the plate to be turned on fully during the rundown. It also permits a more rapid turn on and turn off since the total excursion of the suppressor voltage is limited. The capacitor, C307, compensates for shunt capacitance maintaining the fast risetime necessary to start the sweep quickly.

Sweep Amplifier

The sawtooth is coupled from the cathode follower, V325, through the HOR. SWEEP GAIN, R330, to the cathode follower V325A. The HOR. SWEEP GAIN varies the amount of signal coupled to V325A. The HORIZONTAL POSITION control, R335, and the VERNIER, R338, vary the dc level of the grid of V325A. Cathode follower V435B, which has a drift with line voltage variations similar to V325A, minimizes the trace shift with change in line voltage. The signal is coupled from the cathode follower, V325A, to the cathode coupled amplifiers, V350A & B. The MAGNIFIER switch inserts different coupling resistors between the cathodes of V350A & B changing the gain of this stage to provide the desired magnification of the sweep. The MAG CAL ADJ. control, R347, calibrates this stage. The MAG CENTERING control, R370, sets the dc balance of the cathode followers, V370A & B. Capacitor C370 eliminates interference generated by the dc restorer. The sweep is amplified in the output amplifiers, V380A & B, and dc coupled to the horizontal deflection plates of the crt.

LV POWER SUPPLY

General

The plate and heater power is provided by transformer T401. The primary is wound with two equal 117 volt windings that can be connected either in parallel for 117 volt operation or in series for 234 volt operation. The power supply will operate satisfactorily over the voltage ranges 105 to 125 volts and 210 to 250 vo'ts, 50 to 60 cycles. The secondary contains one high voltage winding and five separate heater windings.

+280-Volt Supply

The ac voltage from the high voltage winding is rectified by a bridge connected full-wave rectifier. A voltage-reference tube, V450, serves as the basic voltage reference of this power supply. The voltage on this tube is compared with the voltage on the divider, R463, R464, and R465, between the +280 bus and ground. R464, labe'ed +280 ADJ on the chassis, is an adjustment which determines the percentage of voltage division that appears at V455A and thereby determines the total voltage across that divider. The voltage difference between the two grids of V455 appears as an amplified error signal at the plate of V455B. The error signal is further amplified by V435A and dc coupled to the grids of the series regulator tubes. A change of bias will introduce a change of voltage drop across the tubes in the direction to correct any difference in the vo'tage between the grids of V455A & B. The capacitors, C439 and C460, bypassing the dc-coupled dividers, increase the ac gain of the feedback loop and thereby reduce ripple. C465, between the +280 bus and ground, acts as a low impedance to ground for all frequencies above 2 kc. A portion of the ripple ahead of the regulator tube is applied to the screen of V435A through R435. The phase of this ripple is such that the ripple in the regulated supply is minimized.

+120-Volt Supply

In the +120 volt supply, V415 compares the vo'tage at the divider, R411 and R412, to the output of the +120 v supply. The error signal is amplified by V415, and dc coupled to the series regulator tube, V420. The bypass capacitor, C420, increases the ac gain of the feedback loop and thereby reduces ripple. C422A, between the +120 bus and ground, acts as a low impedance to ground for frequencies above 10 kc.

CRT CIRCUIT

High-Voltage Supply

The high-voltage supply provides the high accelerating voltages for the cathode-ray tube. The accelerating volt-

age for the crt is supplied by a 60-kc oscillator and rectifier. The oscillator tube, V911, is connected as a Hartley oscillator with the transformer primary as the tapped inductor and C914 as the capacitor. The rectifiers, V940 and V941, make up a full-wave rectifier supplying the accelerating voltage to the crt.

High-Voltage Regulator

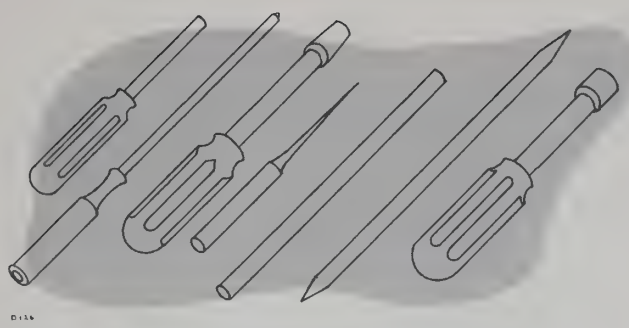
The high voltage is regulated by comparing the voltage from the divider R923, R924, R925, R929 and R931, with ground at the grid of V920A. The error signal is amplified in the comparator tube and coupled through cathode follower V907B to the screen of V911, the oscillator tube. The error signal varies the output amplitude of the oscillator to produce the necessary regulation. . The network consisting of R921, R922 and C922 connected to the grid of V920B, compensates for changes in vertical-amplified gain caused by changes in line voltage, by varying the accelerating voltage on the crt. The discharge time of C922 matches that time necessary for the heaters of the amplifier tubes to affect gain.

Unblanking

The control-grid voltage is produced by a separate winding and a rectifier, V952, similar to the cathode supply, but isolated electrically from it. The positive end of the control-grid supply is connected to the cathode of the unblanking cathode follower, V315, in the sweep circuit. The negative end is connected to the control grid through the INTENSITY control, R952. When the unblanking pulse is produced at the unblanking cathode follower, it drives the entire grid-voltage supply with it so that the same pulse appears at the grid of the crt. C955 transmits the leading edge of the unblanking pulse to reduce unblanking time for the fast sweep.

Geometry Adjust

The second-anode potential required for best linearity at the extremes of deflection may vary for different crt's. R961, labeled GEOM ADJ permits this voltage to be varied.



SECTION 4

MAINTENANCE

PARTS ORDERING INFORMATION

Instruction Manual

A Tektronix instruction manual usually contains hand-made changes to diagrams and parts lists, and sometimes text. These changes are in general appropriate only to the instrument the manual was prepared for. These hand-made corrections show changes to the instrument that have been made after the printing of the manual.

There is a serial number on the frontispiece and on the warranty page of this manual. This is the serial number of your instrument. Be sure the manual number matches the instrument number when you order parts.

NOTE

Always include the instrument type AND SERIAL NUMBER in any correspondence regarding the instrument.

Standard Components

Tektronix will supply replacement components at current net prices. However, since most of the components are standard electronic and radio parts you can probably obtain them locally faster than we can ship them to you from the factory in Portland, Oregon. Be sure to consult the instruction manual to see what tolerances are required

Selected Components

We specially select some of the components, whose values must fall within prescribed limits, by sorting through our regular stocks. The components so selected will have standard RETMA color coding showing the value and tolerance of the stock they were selected from, but they will not in general be replaceable from dealer's stocks.

Checked Tubes

To obtain maximum reliability and performance we check some of the vacuum tubes used in our instruments for such characteristics as microphonics, balance, transconductance, etc. We age other tubes to stabilize their characteristics. Since there are no well defined standards of tube performance we have established our own arbitrary standards and have developed equipment to do this checking. These checked tubes can be purchased through our local Field Engineering Offices or directly from the factory in Portland, Oregon.

Tektronix Manufactured Parts

Tektronix manufactures almost all of the mechanical parts and some of the components used in the instrument. If you order a mechanical part be sure to describe the part completely to prevent any unnecessary delay in filling your order. When you have any question about mechanical parts or Tektronix manufactured components contact our nearest Field Engineering Office or write to the Field Engineering Department at the factory in Portland, Oregon.

MECHANICAL MAINTENANCE

Air Filter

The instrument is cooled by filtered forced air. The air filter is constructed of aluminum wool coated with an adhesive. If the filter gets too dirty it will restrict the flow of cooling air and cause the instrument to overheat. The filter should be inspected every three or four months and cleaned if necessary.

To clean the filter, run hot water through it from the side that was inside. Or slosh it around in hot soapy water and rinse it in clear water. Then dry it thoroughly and coat it with new adhesive. When new, the filter is coated with "Filter Coat", a product of the Research Products Corporation. "Filter Coat" should be easy to get locally; look in the classified section of your phone book for RP Air Filters or EZ Kleen Air Filters. Other adhesive materials are no doubt satisfactory.

Fan Motor

The fan motor bearings will require oiling every few months or every thousand hours of operation. Use a good grade of light machine oil and apply only a drop or two.

GENERAL INFORMATION

Color Coding

We use color coded wires in the instruments to help identify the various circuits. These wires will be either a solid color or will be a solid color (including black and white) with one or more colored stripes. The colored stripes are "read" in the same manner as the RETMA resistor color code. In the case of multiple stripes the wide stripe is read first.

Wires carrying positive regulated-power-supply voltages are white and the stripes indicate the supply voltage. For example, the +280-v supply bus will be coded red-gray-brown (2-8-1) giving two significant figures and the decimal multiplier.

The mains-voltage leads to the power transformer are yellow and coded brown-brown-brown (1-1-1).

The tube heater leads are white and coded 6-1, 6-2, 6-3, etc., not to indicate that the voltages are different but to differentiate between circuits.

Soldering and Ceramic Strips

Many of the components in your Tektronix instrument are mounted on ceramic terminal strips. The notches in these strips are lined with a silver alloy. Repeated use of excessive heat, or use of ordinary tin-lead solder will break down the silver-to-ceramic bond. Occasional use of tin-lead solder will not break the bond if excessive heat is not applied.

If you are responsible for the maintenance of a large number of Tektronix instruments, or if you contemplate frequent parts changes, we recommend that you keep on hand a stock of solder containing about 3% silver. This type of solder is used frequently in printed circuitry and should be readily available from radio-supply houses. If you prefer, you can order the solder directly from Tektronix in one-pound rolls. Order by Tektronix part number 251-514.

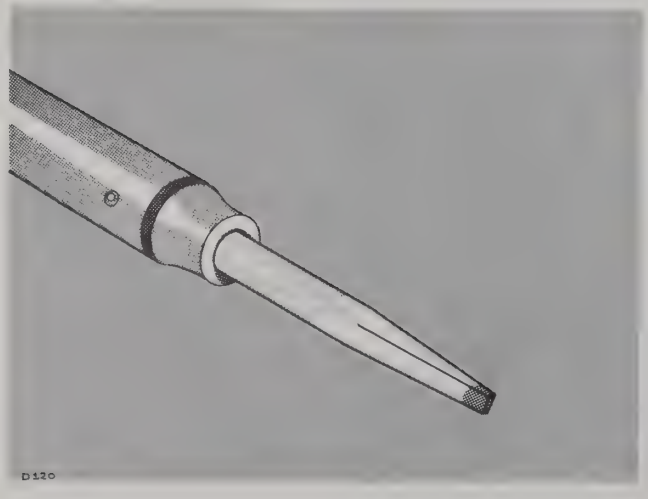


Fig. 4-1. Soldering iron tip properly shaped and tinned.

Because of the shape of the terminals on the ceramic strips it is advisable to use a wedge-shaped tip on your soldering iron when you are installing or removing parts from the strips. Fig. 4-1 will show you the correct shape for the tip of the soldering iron. Be sure to file smooth all surfaces of the iron which will be tinned. This prevents solder from building up on rough spots where it will quickly oxidize.

When removing or replacing components mounted on the ceramic strips you will find that satisfactory results are obtained if you proceed in the manner outlined below.

1. Use a soldering iron of about 75-watt rating.
2. Prepare the tip of the iron as shown in Fig. 4-1.
3. Tin only the first 1/16 to 1/8 inch of the tip. For soldering to ceramic terminal strips tin the iron with solder containing about 3% silver.
4. Apply one corner of the tip to the notch where you wish to solder (see Fig. 4-2).

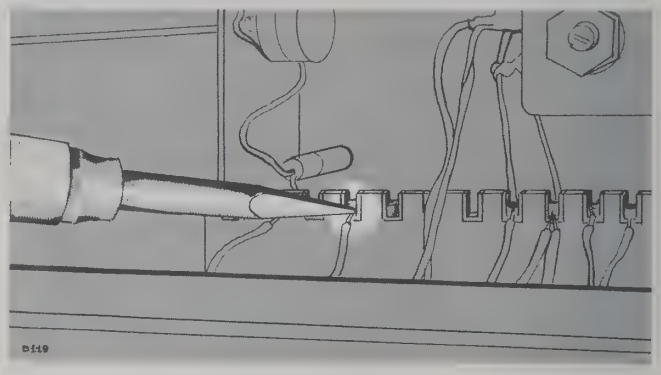


Fig. 4-2. Correct method of applying heat in soldering to a ceramic strip.

5. Apply only enough heat to make the solder flow freely.
6. Do not attempt to fill the notch on the strip with solder; instead apply only enough solder to cover the wires adequately, and to form a slight fillet on the wire as shown in Fig. 4-3.

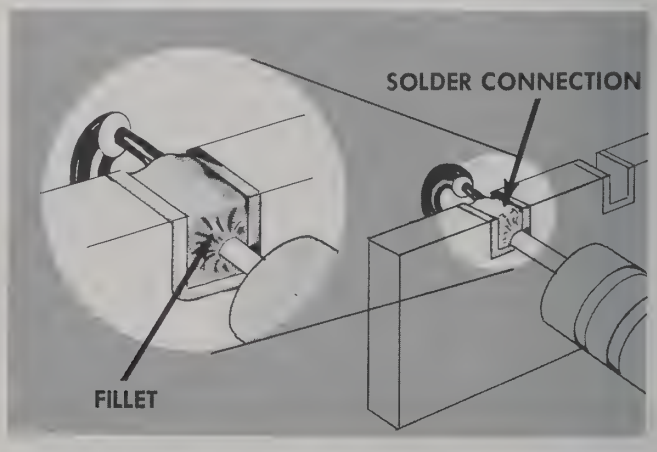


Fig. 4-3. A slight fillet of solder is formed around the wire when heat is applied correctly.

In soldering to metal terminals (for example, pins on a tube socket) a slightly different technique should be employed. Prepare the iron as outlined above, but tin with ordinary tin-lead solder. Apply the iron to the part to be soldered as shown in Fig. 4-4. Use only enough heat to allow the solder to flow freely along the wire so that a slight fillet will be formed as shown in Fig. 4-3.

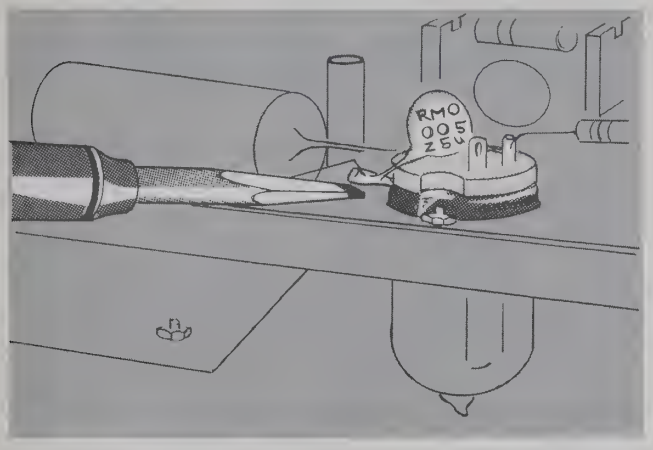


Fig. 4-4. Soldering to a terminal. Note the slight fillet of solder—exaggerated for clarity—formed around the wire.

General Soldering Considerations

When replacing wires in terminal slots clip the ends neatly as close to the solder joint as possible. In clipping ends of wires take care the end removed does not fly across the room as it is clipped.

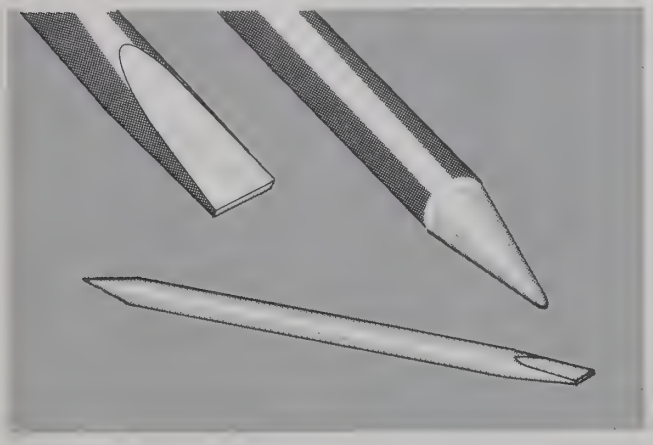


Fig. 4-5. A soldering aid constructed from a ¼ inch wooden dowel.

Occasionally you will wish to hold a bare wire in place as it is being soldered. A handy device for this purpose is a short length of wooden dowel, with one end shaped as shown in Fig. 4-5. In soldering to terminal pins mounted in plastic rods it is necessary to use some form of "heat sink" to avoid melting the plastic. A pair of long-nosed pliers (see Fig. 4-6) makes a convenient tool for this purpose.

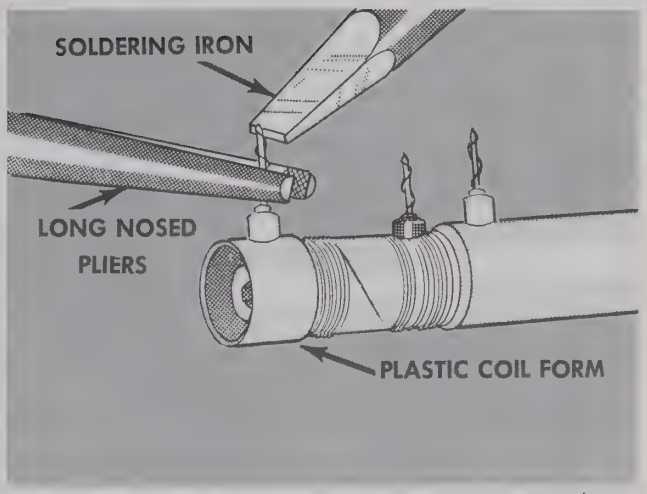


Fig. 4-6. Soldering to a terminal mounted in plastic. Note the use of the long-nosed pliers between the iron and the coil form to absorb the heat.

Ceramic Strips

Two distinct types of ceramic strips have been used in Tektronix instruments. The earlier type mounted on the chassis by means of #2-56 bolts and nuts. The later type is mounted with snap-in, plastic fittings. Both styles are shown in Fig. 4-7.

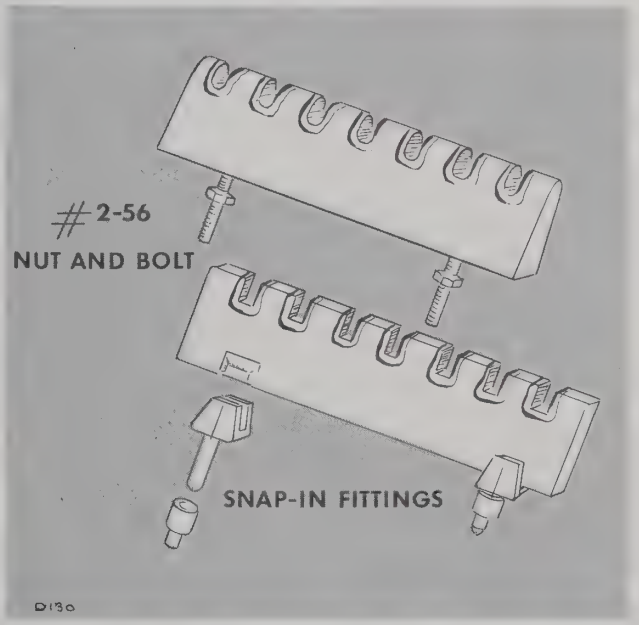


Fig. 4-7. Two types of ceramic strip mountings.

To replace ceramic strips which bolt to the chassis, screw a #2-56 nut onto each mounting bolt, positioning the nut so that the distance between the bottom of the nut and the bottom of the ceramic strip equals the height at which you wish to mount the strip above the chassis. Secure the nuts to the bolts with a drop of red glyptal. Insert the bolts through the holes in the chassis where the original strip was mounted, placing a #2 starwasher between each nut and the chassis. Place a second set of #2 flatwashers on the protruding ends of the bolts, and fasten them firmly with another set of #2-56 nuts. Place a drop of red glyptal over each of the second set of nuts after fastening.

Mounting Later Ceramic Strips

To replace strips which mount with snap-in plastic fittings, first remove the original fittings from the chassis. Assemble the mounting post on the ceramic strip. Insert the nylon collar into the mounting holes in the chassis. Carefully force the mounting post into the nylon collars. Snip off the portion of the mounting post which protrudes below the nylon collar on the reverse side of the chassis.

NOTE

Considerable force may be necessary to push the mounting rods into the nylon collars. Be sure that you apply this force to that area of the ceramic strip directly above the mounting rods.

TROUBLESHOOTING

General

This is a complex electronic instrument. There is no simple way of locating troubles. An understanding of the functions of the circuit is the best help. With an understanding of the circuits, you will generally be able to localize the trouble just from front panel observations.

Troubles are usually caused by tube failure. You can frequently correct them by finding the bad tube and replacing it with a good one. However, sometimes a tube burns up resistors or overstresses capacitors when it fails, and in these cases you will also have to find these bad components. Sometimes you can find them by visual inspection. One way to find bad tubes is to try replacing suspected tubes with good ones. If possible, replace all suspected tubes at one time, and if the trouble is helped, return the old ones, one at a time until the offending one is discovered.

Power Supply

Correct operation of the power supply is necessary for proper operation of most other circuits in the instrument. So an early step to take when you look for troubles is to check the voltages of the power supplies. All the regulated supplies should be within five per cent of their rated values and should remain steady as the line voltage is varied from 105 to 125 volts or 210 to 250 volts.

If the instrument fails to operate at all, including the fan and pilot light, check the source of power and determine that the power-cord plug is securely in place. Then check the fuse at the front of the instrument. If the instrument has been operating but has just stopped, it may have overheated and tripped the thermal cutout. The thermal cutout will reset itself when the instrument cools down enough. Possible causes of overheating are fan stoppage, restriction of air circulation or high room temperature. Be sure the air filter is clean.

Deflection Systems

Use of the block diagram and front panel indications will help you to localize an inoperative circuit rapidly.

If the spot is not visible, center the positioning controls. Then advance the intensity control to see if there is a glow indicating a spot positioned off the screen. If no spot can be obtained, short the horizontal deflection plates together and the vertical plates together. If this does not return the spot to the screen, check the high-voltage supply in the crt circuit.

If the spot is returned to the screen by shorting the deflection plates, check the deflection amplifier concerned. Further trouble will best be located by the combined use of a test oscilloscope and the circuit diagram.

ADJUSTMENT PROCEDURE

Low-Voltage Power Supply

The +280 ADJ control determines the voltage level at the grid of comparator tube V455 and thus determines the level of the +280-volt power supply.

a. Connect a meter between pin 6 of V448 and ground.

b. Set +280 ADJ, located on the left side panel, for a reading of +280 volts.

High-Voltage Supply

The sensitivity and calibration of the instrument is dependent upon the crt accelerating voltage.

a. Connect a meter from ground to the outer-most terminal on the two-terminal ceramic strip located under the crt neck near the —1350 ADJ.

b. Set the —1350 ADJ control to obtain —1350 volts. This control is located on the chassis, near the left, rear corner.

Geometry Adjustment

The second-anode voltage required for best linearity at the extremes of deflection may vary somewhat between tubes.

a. Display a large amplitude calibrator waveform on the crt.

b. Adjust the GEOM ADJ control for straight vertical lines on the crt. The GEOM ADJ control is located on the left side panel of the chassis.

Unblanking Phase Adjustment

C915 provides a phasing adjustment in the unblanking section of the high-voltage supply.

a. Set the HORIZONTAL DISPLAY switch to the FIELD position, the MAGNIFIER switch to 25X, and the VERTICAL RESPONSE switch to FLAT.

b. With a video signal displayed, adjust C915 to reduce signal wiggle or with no signal in, adjust C915 to obtain a trace of even intensity. C915 is located in the crt circuit beneath the high-voltage shield.

Calibrator

When properly set, the calibrator develops 100 volts across the voltage divider in the cathode of V30B. This calibrator is capable of an accuracy approaching one percent. To preserve this accuracy, a voltmeter having an accuracy of one percent or better should be used for this adjustment.

1. Calibrator Adj.

a. Remove V245 which is one-half of the calibrator multivibrator.

b. Connect an accurate voltmeter from pin 8 of V30 to ground.

c. Set the INPUT SELECTOR switch at .05V and the VERTICAL RESPONSE switch at FLAT.

d. Set the CAL ADJ control for 100 volts. The CAL ADJ control is located on the left side panel of the chassis.

e. Replace V245.

2. Cal. Scale Adj.

The CAL SCALE ADJ control R38, located on the bracket adjacent to the AMPLITUDE CALIBRATOR control, is preset and sealed at the factory. Should this control be changed, you can make this adjustment or you can order a preset replacement assembly consisting of R37, R38, and R39 from our Field Representative or direct from our factory.

a. Set the INPUT SELECTOR to .5V and the AMPLITUDE CALIBRATOR at .5V.

b. Set the VARIABLE VERTICAL GAIN control for 5 cm deflection (0-100).

c. Set the AMPLITUDE CALIBRATOR control at .2 and adjust R38 for 2 cm of deflection

Horizontal Deflection System

The sweep circuit in the Type 525 is quite stable and since it is not a calibrated sweep, frequent adjustment should not be necessary.

1. Mag Centering

The MAG CENTERING control, located on the left side panel, allows the positioning circuits to be adjusted so that the part of the trace that is centered will remain centered for all positions of the MAGNIFIER switch.

a. Set the MAGNIFIER control on 25X and the HORIZONTAL RATE control CCW.

b. Position the trailing edge of the fourth calibrator square wave to the center of the graticule with the HORIZONTAL POSITION control.

c. Set the MAGNIFIER control on 1X and adjust MAG CENTERING control to align the same trailing edge to the graticule center.

2. Horizontal Sweep Gain

The HOR SWEEP GAIN control, located on the left side panel, provides a means of setting the sweep length so it fills the graticule without hitting the sides of the crt with attendant electron scattering.

a. Set the MAGNIFIER switch to 1X.

b. Adjust the HOR SWEEP GAIN so that the sweep is the same length as the graticule lines.

3. Mag Cal Adj

The MAG CAL ADJ control sets the gain of the sweep amplifier to calibrate the magnifier switch positions.

a. Set the MAGNIFIER switch on the 5X position, and the HORIZONTAL RATE control at its full clockwise position.

b. Display a sine wave of approximately 600 kc and vary this frequency as necessary to obtain 10 cycles over the length of a graticule line.

c. Set the MAGNIFIER switch to 25X.

d. Adjust the MAG CAL ADJ control so that there are 2 cycles displayed over the length of a graticule line.

e. Set the MAGNIFIER switch to 1X position. There should be approximately 50 cycles displayed.

4. Sweep Amplifier High-Frequency Comp

C332 provides high-frequency compensation for a voltage divider in the sweep amplifier. This capacitor is located on the bottom side of the chassis between the HORIZONTAL DISPLAY switch and SCALE ILLUM control.

a. Display the calibrator waveform.

b. Rotate the MAGNIFIER switch to 1X and position the first cycle near the center of the crt.

c. Rotate the HORIZONTAL RATE control and adjust C332 so that the start of the sweep remains almost stationary as the control is rotated.

Vertical Deflection System

1. DC Balance

The DC BALANCE control is adjusted to minimize trace shift when the VERTICAL GAIN ATTENUATOR is changed.

a. FIRST-STAGE DC BALANCE

Rotate the VERTICAL GAIN ATTENUATOR switch back and forth. If the trace shifts position, slowly turn the FIRST-STAGE DC BAL control until the trace remains steady while the switch is being rotated.

b. SECOND-STAGE DC BALANCE

Rotate the VARIABLE VERTICAL GAIN ATTENUATOR control back and forth. If the trace shifts position, slowly turn the SECOND-STAGE DC BAL control until the trace remains steady while the control is being rotated.

2. Vert Pos Range

Turn DC REST. to OFF. Turn VERTICAL POSITION and VERNIER controls all the way clockwise. With no input signal, adjust VERT POS RANGE to position trace at top of the crt.

DC REST. should be OFF for all of the following adjustments to the Vertical Deflection System.

3. Vertical Calibration

a. Set the following controls as indicated: INPUT SELECTOR at .05V; AMPLITUDE CALIBRATOR at .45 (.045-V); VERTICAL GAIN ATTENUATOR at 1X; VARIABLE ATTENUATOR CW.

b. Adjust VERTICAL GAIN SET, located on the left side panel, for 3 cm deflection (0-60).

c. Turn the INPUT SELECTOR to .15v, the VERTICAL GAIN ATTENUATOR on 2X, and the VARIABLE ATTENUATOR CW.

d. Adjust R47, located on the attenuator switch, for 4½ cm of deflection (0-90).

e. Turn the INPUT SELECTOR to .5v, the VERTICAL GAIN ATTENUATOR on 5X, and the VARIABLE ATTENUATOR CW.

f. Adjust R48, located on the attenuator switch, for 6 cm of deflection (—20 to 100).

4. Frequency Compensation

We set the Type 525 Frequency compensation with a Tektronix Type 190 Constant-Amplitude Signal Generator. The following procedure is written assuming the input voltage is maintained at a constant amplitude once it is set.

a. Set the VERTICAL RESPONSE switch to FLAT.

b. Display a 450 kc sine wave and adjust the generator to obtain 5 cm deflection (0-100) with VERTICAL GAIN ATTENUATOR switch on 1X and the VARIABLE ATTENUATOR CCW.

c. Increase the frequency to 2.5 mc and adjust L191, located on top of the chassis along the left side of the crt neck, for 5 cm of deflection.

d. Increase the frequency to 5 mc and adjust L84 and L87 equally for 5 cm of deflection. L84 and L87 are located on the under side of the chassis on the preamp.

e. Return to 2.5 mc and check for 5 cm deflection adjusting L191 as necessary.

f. Rotate the red VERTICAL GAIN control clockwise against the stop. Set generator for 5 cm deflection at 1 mc.

g. Set generator frequency at 5 mc and adjust L80, located at the rear of the preamp, as necessary to obtain 5 cm deflection.

h. Set VERTICAL ATTENUATOR switch to 5X and adjust the signal generator for 5 cm deflection at 1 mc.

i. Set signal generator on 5 mc and adjust L49 for 5 cm of deflection.

j. Set the VERTICAL RESPONSE switch to LOW PASS. Return VERTICAL GAIN ATTENUATOR to 1X.

k. Set the sine-wave generator at 3.58 mc and adjust C158 for minimum vertical deflection. C158 is located on the underside of the chassis on the VERTICAL RESPONSE switch.

l. Set the VERTICAL RESPONSE switch to HIGH PASS.

m. Adjust L163 for maximum vertical deflection at 3.58 mc. L163 is located on the underside of the chassis near the vertical response switch.

n. Return VERTICAL RESPONSE switch to FLAT.

o. Set the sine-wave generator frequency at 3.58 mc and adjust the generator signal amplitude for 1 cm deflection.

p. Set the VERTICAL RESPONSE switch to HIGH PASS and set the H.P. GAIN ADJ for 5 cm deflection. H.P. GAIN ADJ is located on the top of the chassis next to the power transformer.

q. Set VERTICAL RESPONSE switch to FLAT. Display a 100 cycle square wave. The calibrator will not do.

r. Adjust R65, labeled LF COMP, located on top of preamp chassis, for flat, horizontal tops on the square wave.

5. DC Restorer Adjustment

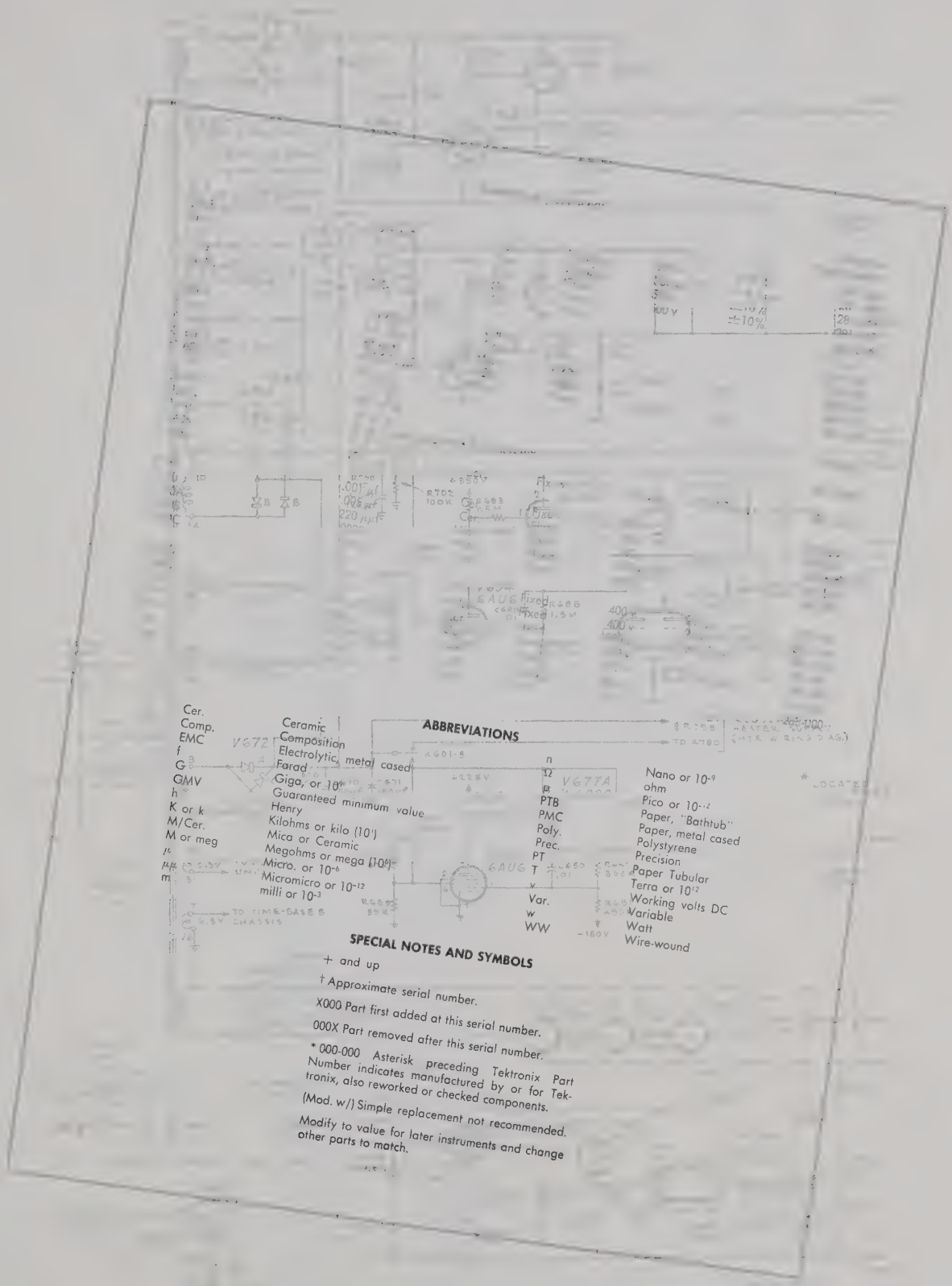
C259 is adjusted to set the width of keying pulses at the proper value.

a. Display 7 cm of video waveform and switch the DC REST. to ON.

b. If a test scope is available, attach the probe to either end of R278 and adjust C259 for a keying pulse width of from .8 to 1 μsec.

c. If no test scope is available, C259 can be adjusted in the following manner: With video signal presented and DC REST. ON as in step a, position the display so that the sync pulses rest at —40. Adjust C259 so that sync pulses are perfectly flat-topped in the vertical blanking area. Switch from INT. TRIG. to EXT. TRIG. and adjust C259 for flat-topped pulses in both trigger settings.

PARTS LIST *and* DIAGRAMS


ABBREVIATIONS
Cer. Ceramic
Comp. Composition
EMC Electrolytic, metal cased
f Farad
G Giga, or 10^{9}
GMV Guaranteed minimum value
h Henry
K or k Kilohms or kilo (10^{3})
M/Cer. Mica or Ceramic
M or meg Megohms or mega (10^{6})
μ Micro. or 10^{-6}
μμ Micromicro or 10^{-12}
m milli or 10^{-3}
n Nano or 10^{-9}
Ω ohm
μμ Pico or 10^{-12}
PTB Paper, "Bathtub"
PMC Paper, metal cased
Poly. Polystyrene
Prec. Precision
PT Paper Tubular
T Terra or 10^{12}
v Working volts DC
Var. Variable
w Watt
WW Wire-wound
SPECIAL NOTES AND SYMBOLS
+ and up
† Approximate serial number.
X000 Part first added at this serial number.
000X Part removed after this serial number.
* 000-000 Asterisk preceding Tektronix Part Number indicates manufactured by or for Tektronix, also reworked or checked components.
(Mod. w/) Simple replacement not recommended. Modify to value for later instruments and change other parts to match.

MANUFACTURERS OF CATHODE-RAY OSCILLOSCOPES

HOW TO ORDER PARTS

Replacement parts are available through your local Tektronix Field Office.

Improvements in Tektronix instruments are incorporated as soon as available. Therefore, when ordering a replacement part it is important to supply the part number including any suffix, instrument type, serial number, plus a modification number where applicable.

If the part you have ordered has been improved or replaced, your local Field Office will contact you if there is a change in part number.

PARTS LIST

Values are fixed unless marked Variable.

Bulbs

Ckt. No.	S/N Range	Description	Tektronix Part Number
B405		Incandescent Type #47 Pilot Light	150-001
B406		Incandescent Type #47 Graticule Light	150-001
B407		Incandescent Type #47 Graticule Light	150-001

Capacitors

Tolerance 20% unless otherwise indicated.

C10		.1 μf	PTM	600 v		285-528
C13		6.25 μf	EMT	300 v	—10%+100%	290-000
C15		.1 μf	PTM	600 v		285-528
C18		22 μμf	Cer.	500 v	10%	281-511
C21		22 μμf	Cer.	500 v	10%	281-511
C23		.01 μf	PTM	400 v		285-510
C28		.01 μf	PTM	400 v		285-510
C35		4.7 μμf	Cer.	500 v	±1 μμf	281-501
C36		39 μμf	Cer.	500 v	10%	281-517
C41A,B		2 x 15 μf	EMC	350 v	—10%+100%	290-034
C55		6.25 μf	EMT	300 v	—10%+100%	290-000
C59		.1 μf	PTM	400 v		285-526
C60		.1 μf	PTM	400 v		285-526
C76		.01 μf	Discap	150 v		283-003
C79		.01 μf	Discap	150 v		283-003
C83A,B		2 x 15 μf	EMC	350 v	—10%+100%	290-034
C105		.01 μf	PTM	400 v		285-510
C106		.01 μf	PTM	400 v		285-510
C119 †		.02 μf	Cer.	600 v		295-056
C120 †		.02 μf	Cer.	600 v		295-056
C121 ††		.02 μf	Cer.	600 v		295-056
C122 ††		.02 μf	Cer.	600 v		295-056
C145	X1300-up	130 μμf	Discap	500 v	1%	283-053
C146	X1300-up	130 μμf	Discap	500 v	1%	283-053
C151		100 μμf	Cer.	350 v		281-523
C152		100 μμf	Cer.	350 v		281-523
C153		47 μμf	Cer.	500 v		281-518
C154		470 μμf	Cer.	500 v		281-525
C156		51 μμf	Cer.	500 v	5%	281-540
C157	101-1299	47 μμf	Cer.	500 v		281-518
C157	1300-up	12 μμf	Cer.	500 v	5%	281-508
C158		8-50 μμf	Cer. Var.			281-013
C168		47 μμf	Cer.	500 v		281-518
C175		.02 μf	Discap	150 v		283-004
C176		.001 μf	Discap	500 v		283-000
C193		.01 μf	Discap	150 v		283-003
C194		.01 μf	Discap	150 v		283-003
C201		.01 μf	PTM	400 v		285-510
C202		.01 μf	PTM	400 v		285-510

† C119 and C120 are matched within 2½% of each other. Furnished as a unit.

†† C121 and C122 are matched within 2½% of each other. Furnished as a unit.

Capacitors *(continued)*

							Tektronix Part Number
C211		6.25 μf	EMT		300 v	—10%+100%	290-000
C221		.01 μf	PTM		400 v		285-510
C222		.01 μf	PTM		400 v		285-510
C224	X591-up	6.25 μf	EMT		300 v	—10%+100%	290-000
C230	X146-177	270 μμf	Cer.		500 v	10%	281-543
	178-up	470 μμf	Cer.		500 v		281-525
C231	101-177X	.01 μf	PTM		400 v		285-510
C235		22 μμf	Cer.		500 v	10%	281-511
C238		.01 μf	PTM		400 v		285-510
C239	101-1109	.01 μf	Discap		150 v		Use 283-002
C239	1110-up	.01 μf	Discap		500 v		283-002
C240		.01 μf	PTM		400 v		285-510
C241	101-1109	.01 μf	Discap		150 v		Use 283-002
C241	1110-up	.01 μf	Discap		500 v		283-002
C245		.1 μf	PTM		400 v		285-526
C255	X146-up	.001 μf	Discap		500 v		283-000
C259	101-145	22 μμf	Cer.		500 v	10%	281-511
	146-up	8-50 μμf	Cer.	Var.			281-013
C264	X146-up	.01 μf	Discap		500 v		283-002
C268A,B		2 x 20 μf	EMC		450 v	—10%+50%	290-037
C307		470 μμf	Cer.		500 v		281-525
C309		47 μμf	Cer.		500 v		281-518
C315		.047 μf	PTM		400 v		285-519
C325		390 μμf	Mica		500 v	5%	295-053
C332		4.5-25 μμf	Cer.	Var.	500 v		281-010
C352	101-1109	.02 μf	Discap		150 v		Use 283-006
C352	1110-up	.02 μf	Discap		600 v		283-006
C370		27 μμf	Cer.		500 v		281-513
C412		.01 μf	PTM		400 v		285-510
C420		.01 μf	PTM		400 v		285-510
C431		2 x 40 μf	EMC		450 v	—10%+50%	290-043
C439		.001 μf	Discap		500 v		283-000
C451		.01 μf	PTM		400 v		285-510
C460		.01 μf	PTM		400 v		285-510
C465		2 x 40 μf	EMC		450 v	—10%+50%	290-043
C470		2 x 1000 μf	EMC		15 v	—10%+250%	290-051
C907		.001 μf	PTM		600 v		285-501
C911		.001 μf	PTM		600 v		285-501
C914		.001 μf	PTM		1000 v		285-502
C915		9-180 μμf	Mica	Var.			281-023
C916	101-899	220 μμf	Mica		500 v	10%	Use 283-510
	900-up	180 μμf	Mica		500 v	5%	283-510
C922		1 μf	PTM		400 v		285-540
C924	101-899	.0068 μf	PTM		3000 v		285-508
	900-up	.01 μf	Discap		2000 v		283-011
C929		.0047 μf	PTM		400 v		285-506
C941		.022 μf	PTM		400 v		285-515
C945		.0068 μf	PTM		5000 v		285-509
C946	101-899	.0068 μf	PTM		3000 v		285-508
	900-up	.01 μf	Discap		2000 v		283-011

Capacitors *(continued)*

						Tektronix Part Number
C947	101-879	.015 μf	PTM	3000 v		285-513
	880-up	.01 μf	Discap	2000 v		283-011
C952	101-899	.0068 μf	PTM	3000 v		285-508
	900-up	.01 μf	Discap	2000 v		283-011
C955	101-879	.015 μf	PTM	3000 v		285-513
	880-up	.01 μf	Discap	2000 v		283-011
C960		.001 μf	Discap	500 v		283-000
C970	101-879	.015 μf	PTM	3000 v		285-513
	880-up	.01 μf	Discap	2000 v		283-011

Diodes

D241		Germanium Diode				152-008
D264	X146-up	Germanium Diode				152-008
D320		Silicon Diode				Use 153-007
D321	101-762X	Germanium Diode				152-008
D432 A-H	X526-1549	Silicon Diode				Use 152-047
D432 A-H	1550-up	Silicon Diode				152-048

Fuses

F401		4 Amp 3 AG	Slo-Blo for 117 V operation 50 & 60 cycle			159-027
		2 Amp 3 AG	Slo-Blo for 234 V operation 50 & 60 cycle			159-023

Inductors

L41		6.4 μh				*108-054
L46	X276-up	.75 μh				*108-072
L47		1.4-2.6 μh	Var.	core 276-032		*114-065
L49	101-275	2.4-6.5 μh	Var.	core 276-032		*114-066
	276-up	1.7-3.8 μh	Var.	core 276-032		*114-108
L51		6.4 μh				*108-054
L80		.79-1.5 μh	Var.	core 276-032		*114-025
L84		11-19 μh	Var.	core 276-503		*114-041
L87		11-19 μh	Var.	core 276-503		*114-041
LR86		5.5 μh on 15 Ω ½ w resistor				*108-111
L145	X1300-up	130 μh				*108-234
L146	X1300-up	130 μh				*108-234
L158		60 μh				*108-109
L163			Var.	core 276-503		*114-074
L191		50-70 μh	Var.	core 276-511		Use *114-148

Rectifiers †

SR430A	101-525X	10-200 ma plates/leg				*106-026
SR430B	101-525X	10-200 ma plates/leg				*106-027
SR430C	101-525X	10-200 ma plates/leg				*106-028
SR430D	101-525X	10-200 ma plates/leg				*106-029
SR470		1-500 ma plate/leg				*106-016

Resistors

Resistors are fixed, composition, ±10% unless otherwise indicated.

R1	10 Ω	½ w					302-100
R8	100 k	½ w		Prec.	1%		309-045
R10	1 meg	½ w					302-105
R11	400 k	½ w		Prec.	1%		309-126
R12	2.5 k	.1 w	Var.		DC Bal. 1st Stage		311-010
R13	10 k	½ w					302-103
R14	400 k	½ w		Prec.	1%		309-126
R15	1 meg	½ w					302-105

† S/N 526-up see D432 (Replacing SR430A,B,C,D.) A kit is available to convert from Selenium Rectifier to Silicon Diodes, Order Mod Kit #040-207.

Resistors *(continued)*

							Tektronix Part Number
R18		82 k	2 w				306-823
R19	101-590	2.7 meg	½ w				302-275
	591-up	2.2 meg	½ w				302-225
R20		2.2 meg	½ w				302-225
R21		39 k	½ w				302-393
R22		47 Ω	½ w				302-470
R23		82 k	½ w			5%	301-823
R24		300 k	½ w			5%	301-304
R25		4.7 meg	½ w				302-475
R27		40 k	5 w		WW	5%	308-010
R28		5 k	2 w	Var.		Cal. Adj.	311-011
R29		20 k	5 w		WW	5%	308-009
R30		9846.75 Ω	5 w		Mica Plate	½%	*310-525
R31		102.9 Ω	½ w		Mica Plate	.2%	*310-526
R32		35.33 Ω	½ w		Mica Plate	.2%	*310-527
R33		10.03 Ω	½ w		Mica Plate	.2%	*310-528
R34		5.004 Ω	½ w		Mica Plate	.2%	*310-529
R35		47 k	½ w				302-473
R36		100 k	½ w			5%	301-104
R37	101-189	5 k	2 w	Var.	WW	AMPLITUDE CALIBRATOR	311-013
R38	101-189	10 k	2 w	Var.	WW	Cal. Scale Adj.	311-015
R39	101-189	Selected value					
R37	190-up	5 k	2 w	Var.	WW	AMPLITUDE CALIBRATOR	
R38	190-up	10 k	2 w	Var.	WW	Cal. Scale Adj.	312-012
R39	190-up	Selected value					
R40		10 k	2 w				306-103
R41		1 k	½ w			5%	301-102
R43		220 Ω	½ w				302-221
R44	X195-up	27 Ω	½ w				302-270
R45		8 k	5 w		WW	5%	308-053
R46		8 k	5 w		WW	5%	308-053
R47		500 Ω	.1 w	Var.			311-056
R48		500 Ω	.1 w	Var.			311-056
R49		680 Ω	½ w				302-681
R50		10 k	2 w				306-103
R51		1 k	½ w			5%	301-102
R53		220 Ω	½ w				302-221
R55		5.6 k	2 w				306-562
R57		47 Ω	½ w				302-470
R59		27 k	2 w				306-273
R60		27 k	2 w				306-273
R61		47 Ω	½ w				302-470
R63		333 k	½ w		Prec.	1%	309-053
R64		100 k	½ w				302-104
R65		2 meg	.1 w	Var.		L. F. Comp.	311-082
R69		1.2 meg	½ w		Prec.	1%	309-149
R70		10 k	.1 w	Var.		DC Bal 2nd Stage	311-017
R71		1.2 meg	½ w		Prec.	1%	309-149
R72		100 k	½ w				302-104
R76	101-177	1 meg	½ w				302-105
	178-up	100 k	½ w				302-104
R77		3 k	5 w		WW	5%	308-082
R78		3 k	5 w		WW	5%	308-082
R79	101-177	1 meg	½ w				302-105
	178-up	100 k	½ w				302-104
R80		355 Ω		Var.	WW	VERTICAL GAIN Use	*311-282

Resistors *(continued)*

							Tektronix Part Number
R81	X195-up	27 Ω	½ w				302-270
R82		1.2 k	5 w		WW	5%	308-063
R83		1.5 k	2 w				306-152
R84		1 k	3 w		Mica Plate	2%	*310-521
R85		1.5 k	2 w				306-152
R87		1 k	3 w		Mica Plate	2%	*310-521
R88		1.5 k	1 w				304-152
R93		47 Ω	½ w				302-470
R94		47 Ω	½ w				302-470
R95		27 k	2 w				306-273
R96		27 k	2 w				306-273
R103		47 Ω	½ w				302-470
R104		47 Ω	½ w				302-470
R105		10 k	5 w		WW	5%	308-054
R106		10 k	5 w		WW	5%	308-054
R111		4.7 meg	½ w				302-475
R112		4.7 meg	½ w				302-475
R113		6.8 meg	½ w				302-685
R114		6.8 meg	½ w				302-685
R119	101-145	1 meg	½ w				302-105
	146-up	2.2 meg	½ w				302-225
R120	101-145	1 meg	½ w				302-105
	146-up	2.2 meg	½ w				302-225
R121	101-145	1 meg	½ w				302-105
	146-up	2.2 meg	½ w				302-225
R122	101-145	1 meg	½ w				302-105
	146-up	2.2 meg	½ w				302-225
R131 †		5 k	2 w	Var.	WW	VERNIER	311-079
R132		78 k	½ w		Prec.	1%	309-168
R133		68 k	½ w		Prec.	1%	309-042
R134		6.8 k	½ w				302-682
R135 †		10 k	2 w	Var.	WW	VERTICAL POSITION	311-079
R136		5.6 k	½ w			5%	301-562
R137	101-264	2.5 k	.1 w	Var.		Vert. Pos. Range	Use 311-074
	265-up	5 k	.1 w	Var.			311-074
R145	101-1299	470 Ω	½ w				302-471
R145	1300-up	1.28 k	½ w		Prec.	1%	309-241
R146	101-1299	470 Ω	½ w				302-471
R146	1300-up	1.28 k	½ w		Prec.	1%	309-241
R147	101-1299X	3.9 k	½ w				302-392
R148	101-1299X	3.9 k	½ w				302-392
R151		820 Ω	½ w				302-821
R152		820 Ω	½ w				302-821
R153		8.2 k	½ w				302-822
R154		8.2 k	½ w				302-822
R156		22 k	½ w				302-223
R161		1 k	½ w				302-102
R162		1 k	½ w				302-102
R165		47 Ω	½ w				302-470
R166		47 Ω	½ w				302-470
R167		4.7 k	1 w				304-472
R168		4.7 k	1 w				304-472
R169		22 k	½ w				302-223
R171		10 k	2 w	Var.		Hi Pass Gain Adj.	311-076

† R131 and R135 furnished as a unit.

Resistors *(continued)*

							Tektronix Part Number
R172		12 k	2 w				306-123
R173		12 k	2 w				306-123
R175		2.2 meg	½ w				302-225
R176		2.2 meg	½ w				302-225
R177		47 Ω	½ w				302-470
R178		47 Ω	½ w				302-470
R181		15 k	2 w				306-153
R182		15 k	2 w				306-153
R185		47 Ω	½ w				302-470
R186		47 Ω	½ w				302-470
R187		3 k	5 w		WW	5%	308-062
R188		3 k	5 w		WW	5%	308-062
R189		200 Ω	2 w	Var.		Vertical Gain Set	311-004
R190		470 Ω	2 w				306-471
R191		2.5 k	5 w		Mica Plate	1%	*310-522
R192		2.5 k	5 w		Mica Plate	1%	*310-522
R193	101-177	1 meg	½ w				302-105
	178-up	100 k	½ w				302-104
R194	101-177	1 meg	½ w				302-105
	178-up	100 k	½ w				302-104
R196		5.6 k	2 w				306-562
R201		47 Ω	½ w				302-470
R202		47 Ω	½ w				302-470
R203		2.2 meg	½ w				302-225
R208		2.2 meg	½ w				302-225
R211		56 k	½ w				302-563
R212		1.8 meg	½ w				302-185
R213		2.2 meg	½ w				302-225
R218		12 k	2 w				306-123
R220		2.2 meg	½ w				302-225
R221		47 Ω	½ w				302-470
R222		47 Ω	½ w				302-470
R223		1 meg	½ w				302-105
R224	X591-up	12 k	1 w				304-123
R225		2.2 meg	½ w				302-225
R226	X591-up	51 k	½ w			5%	301-513
R227	X591-up	56 k	½ w			5%	301-563
R228	101-590	12 k	2 w				306-123
	591-up	6.8 k	1 w				304-682
R230	X146-177	68 k	½ w				302-683
	178-up	470 k	½ w				302-474
R231		12 k	1 w				304-123
R232		22 meg	½ w				302-226
R233		47 Ω	½ w				302-470
R234	X178-up	2.7 meg	½ w				302-275
R235		68 k	½ w		Prec.	1%	309-042
R236		10 k	½ w		Prec.	1%	309-100
R238		18 k	½ w				302-183
R239		10 k	½ w				302-103
R241		1 meg	½ w				302-105
R242		470 k	½ w				302-474

							Tektronix Part Number
R244		47 Ω	½ w				302-470
R245		100 k	½ w				302-104
R255		100 k	½ w			5%	301-104
R256		100 k	½ w			5%	301-104
R258		180 k	½ w				302-184
R259		10 k	½ w				302-103
R264	X146-up	3.9 k	½ w				302-392
R265	101-145	220 k	½ w				302-224
	146-up	1 meg	½ w				302-105
R266		47 Ω	½ w				302-470
R267		47 k	2 w				306-473
R268		4.7 k	2 w				306-472
R275		10 k	½ w				302-103
R276		10 k	½ w				302-103
R277		10 k	½ w				302-103
R278		68 k	1 w				304-683
R305	101-1109	4.7 meg	½ w				Use 302-565
	1110-up	5.6 meg	½ w				302-565
R306		56 k	2 w				306-563
R307		470 k	½ w				302-474
R309		33 k	½ w				302-333
R310		270 k	½ w				302-274
R312		47 Ω	½ w				302-470
R315		47 k	½ w				302-473
R317		10 k	½ w				302-103
R318		4.7 k	½ w				302-472
R319		20 k	2 w	Var.		HORIZONTAL RATE	311-018
R320		50 meg	2 w		Prec.	5%	310-517
R321		183 k	½ w		Prec.	1%	309-050
R325		22 k	2 w				306-223
R326		10 k	½ w				302-103
R327		82 k	½ w				302-823
R330		100 k	2 w	Var.		Horiz. Gain Set	311-026
R331		400 k	½ w		Prec.	1%	309-126
R332		200 k	½ w		Prec.	1%	309-051
R334		15 k	½ w				302-153
R335 †		100 k	½ w	Var.		HORIZONTAL POSITION	Use 311-414
R337		10 meg	½ w				302-106
R338 †		100 k	½ w	Var.		VERNIER	Use 311-414
R339		47 Ω	½ w				302-470
R341		100 k	½ w				302-104
R342		220 k	½ w				302-224
R345		56.5 k	½ w		Prec.	1%	309-040
R346		6 k	½ w		Prec.	1%	309-099
R347		1 k	2 w	Var.		Mag. Cal. Adj.	311-006
R351		47 Ω	½ w				302-470
R352		10 k	½ w				302-103
R353	101-590	10 k	½ w			5%	301-103
	591-up	12 k	½ w			5%	301-123
R354	101-590	15 k	½ w			5%	301-153
	591-up	18 k	½ w			5%	301-183

† R335 and R338 furnished as a unit.

							Tektronix Part Number
R355		33 k	1 w			5%	303-333
R356		33 k	1 w			5%	303-333
R365	101-590	150 k	½ w			5%	301-154
	591-up	120 k	½ w			5%	301-124
R366	101-590	150 k	½ w			5%	301-154
	591-up	120 k	½ w			5%	301-124
R367		33 k	½ w			5%	301-333
R368		33 k	½ w			5%	301-333
R370		10 k	2 w	Var.		Mag. Centering	311-016
R373		47 k	½ w				302-473
R374		47 k	½ w				302-473
R380		12 k	½ w				302-123
R381		47 k	1 w				304-473
R382		47 k	1 w				304-473
R405		50 Ω	2 w	Var.	WW	SCALE ILLUM.	311-055
R411	101-869	200 k	½ w		Prec.	1%	Use 309-243
	870-up	193 k	½ w		Prec.	1%	309-243
R412		150 k	½ w		Prec.	1%	309-049
R414		68 k	½ w				302-683
R415		100 k	½ w				302-104
R418		1 meg	½ w				302-105
R419		1.2 meg	½ w				302-125
R420		2.2 meg	½ w				302-225
R422		10 k	5 w		WW	5%	308-054
R432A-H	X526-1549X	1 meg	½ w				302-105
R435	101-525	33 k	2 w				306-333
	526-up	27 k	2 w				306-273
R436		18 k	1 w				304-183
R439		470 k	½ w				302-474
R440		1 meg	½ w				302-105
R445		470 k	½ w				302-474
R446		47 Ω	½ w				302-470
R447		47 Ω	½ w				302-470
R448		47 Ω	½ w				302-470
R449		47 Ω	½ w				302-470
R450		68 k	½ w				302-683
R451		100 k	½ w				302-104
R452		47 Ω	½ w				302-470
R455		470 k	½ w				302-474
R456		270 k	½ w				302-274
R458		47 Ω	½ w				302-470
R460		560 k	½ w				302-564
R463	101-1069	100 k	½ w		WW		Use 309-334
R463	1070-up	100 k	½ w		Prec.	1%	309-334
R464		10 k	2 w	Var.	WW	+280 Adj.	311-015
R465		40 k	½ w		WW	1%	308-085
R470		.5 Ω	1 w		WW	1%	*308-087
R906		470 k	½ w				302-474
R907		47 Ω	½ w				302-470
R911		47 k	½ w				302-473
R914		1.5 k	½ w				302-152
R920		4.7 k	½ w				302-472

Resistors *(continued)*

					Tektronix Part Number
R921	10 meg	½ w			302-106
R922	10 meg	½ w			302-106
R923	3.3 meg	½ w			302-335
R924	3.3 meg	½ w			302-335
R925	3.3 meg	½ w			302-335
R929	1.8 meg	½ w			302-185
R931	1 meg	2 w	Var.	—350 V Adj.	311-039
R940	4.7 k	½ w			302-472
R941	10 k	½ w			302-103
R942	22 meg	½ w			302-226
R943	22 meg	½ w			302-226
R944	22 meg	½ w			302-226
R946	1 k	½ w			302-102
R952	1 meg	2 w	Var.	INTENSITY	311-041
R953	4.7 meg	2 w			306-475
R954	4.7 meg	2 w			306-475
R955	100 k	½ w			302-104
R956	1.5 meg	1 w			304-155
R960	100 k	2 w	Var.	ASTIGMATISM	311-026
R961	100 k	2 w	Var.	Geom. Adj.	311-026
R965	2.2 meg	1 w			304-225
R966	2.2 meg	1 w			304-225
R967	2 meg	2 w	Var.	FOCUS	311-043
R968	680 k	1 w			304-684
R970	10 k	½ w			302-103
R971	1 meg	½ w			302-105

Transformers

T401	101-639	L. V. Power	*120-078
	640-up	L. V. Power	*120-139
T402	X526-639X	Bucking	*120-137
T940		H. V. Power	*120-077

Switches

				Unwired	Wired
SW5		Rotary	INPUT SELECTOR	*260-162	*262-117
SW11		Rotary	SIGNAL	*260-159	*262-116
SW49		Rotary	VERTICAL GAIN ATTEN.	*260-161	*262-477
SW120		Rotary	DC RESTORER	*260-107	
SW140	101-1299	Rotary	VERTICAL RESPONSE	**260-104	*050-056
SW140	1300-up	Rotary	VERTICAL RESPONSE	*260-104	*262-447
SW220		Toggle	TRIGGER POLARITY	260-014	
SW230		Rotary	HORIZONTAL DISPLAY	*260-160	
SW350		Rotary	MAGNIFIER	*260-105	*262-114
SW401		Toggle	POWER ON	260-134	
TK401		Thermal Cutout 137°F ±5%		260-120	

Electron Tubes

V20	101-590	6BQ7A	154-028
	591-up	6DJ8	154-187
V30	101-590	6BQ7A	154-028
	591-up	6DJ8	154-187
V49	101-194	6AU6	154-022
	195-up	6CB6	154-030

			Tektronix Part Number
V50	101-194	6AU6	154-022
	195-up	6CB6	154-030
V60	101-590	6BQ7A	154-028
	591-up	6DJ8	154-187
V85	101-1549	6CL6	154-031
	1550-up	6CL6	157-006
V86	101-1549	6CL6	154-031
	1550-up	6CL6	157-006
V95	101-590	6BQ7A	154-028
	591-up	6DJ8	154-187
V105	101-590	6BQ7A	154-028
	591-up	6DJ8	154-187
V113		6AL5	154-016
V114		6AL5	154-016
V165	101-590	6BQ7A	154-028
	591-up	6DJ8	154-187
V180	101-590	6BQ7A	154-028
	591-up	6DJ8	154-187
V185		6CL6	154-031
V186		6CL6	154-031
V210		6U8	154-033
V225	101-590	6U8	154-033
	591-up	6DJ8	154-187
V235		6U8	154-033
V245	101-590	6BQ7A	154-028
	591-up	6DJ8	154-187
V260		6U8	154-033
V275	101-590	6BQ7A	154-028
	591-up	6DJ8	154-187
V305		6AL5	154-016
V310	101-497	6AS6	Use 154-223
	498-up	6DB6	154-223
V315	101-590	6BQ7A	154-028
	591-up	6DJ8	154-187
V325	101-590	6BQ7A	154-028
	591-up	6DJ8	154-187
V350	101-590	6BQ7A	154-028
	591-up	6DJ8	154-187
V370	101-590	6BQ7A	154-028
	591-up	6DJ8	154-187
V380	101-590	6BQ7A	154-028
	591-up	6DJ8	154-187
V415		6U8	154-033
V420		12B4	154-044
V435		6U8	154-033
V445		6080/6AS7GA†	154-056
V448		6080/6AS7GA†	154-056
V450		5651	154-052
V455		12AT7	154-039

† 6AS7G may be used in the circuit, Tek #154-020.

			Tektronix Part Number
V859	T0520-1	CRT Standard Phosphor	*154-093
V907	12AT7		154-039
V911	6AQ5		154-017
V920	6U8		154-033
V940	5642		154-051
V941	5642		154-051
V952	5642		154-051

154-0093
$90
Dayton Office

Type 525
Mechanical Parts List

	Tektronix Part Number
ADAPTOR, 3 WIRE TO 2 WIRE S/N 418-up	103-013
ANGLE BRACE, REAR SUPPORT	122-014
ANGLE BRACE, TRANSFORMER	122-015
BAR, 1/4 x 1/2 x 1 1/4 S/N 101-167	381-057
BASE, 3/4 x 1/4 PLATED	432-004
BASE, CRT ROTATOR (BLACK) S/N 870-up	432-022
BOLT, SPADE 6-32 x 3/8	214-012
BRACKET, 1 x 1 15/16 x 1/2	406-020
BRACKET, RECT. MTNG. SN 101-525	406-207
BRACKET, SILICON DIODE SN 526-869	406-490
BRACKET, SILICON RECT. SN 870-up	406-522
BRACKET, RECT. MTNG.	406-217
BRACKET, 1 1/4 x 1 5/8 x 1/2 RT. ANGLE	406-208
BRACKET, FAN SN 101-407	406-209
BRACKET, FAN MOTOR SN 408-up	406-415
BRACKET, POT	406-210
BRACKET, 1/2 x 1 7/16	406-211
BRACKET, CAL. & SIG. SW.	406-212
BRACKET, SW. RESPONSE MTNG.	406-213
BRACKET, CRT EXT. MARKER	406-215
BRACKET, CRT SUPPORT SN 870-up	406-368
BUSHING, HEX 3/8-32 x 13/32	358-029
BUSHING, NYLON, FOR 5 WAY BINDING POST	358-036
CABINET SN 101-1229	437-033
CABINET SN 1230-up	437-057
CABLE HARNESS, POWER SN 101-525	179-113
CABLE HARNESS, POWER SN 526-up	179-359
CABLE HARNESS, CHASSIS	179-114
CABLE HARNESS, PRE-AMP	179-115
CAP, FUSE	200-015
CAP, VINYL BLACK TRANSFORMER	Use 200-372
CHASSIS, MAIN SN 101-590	441-124
CHASSIS, MAIN SN 591-up	441-271
CHASSIS, PREAMP	441-126
CLAMP, CABLE 1/2 PLASTIC	343-006

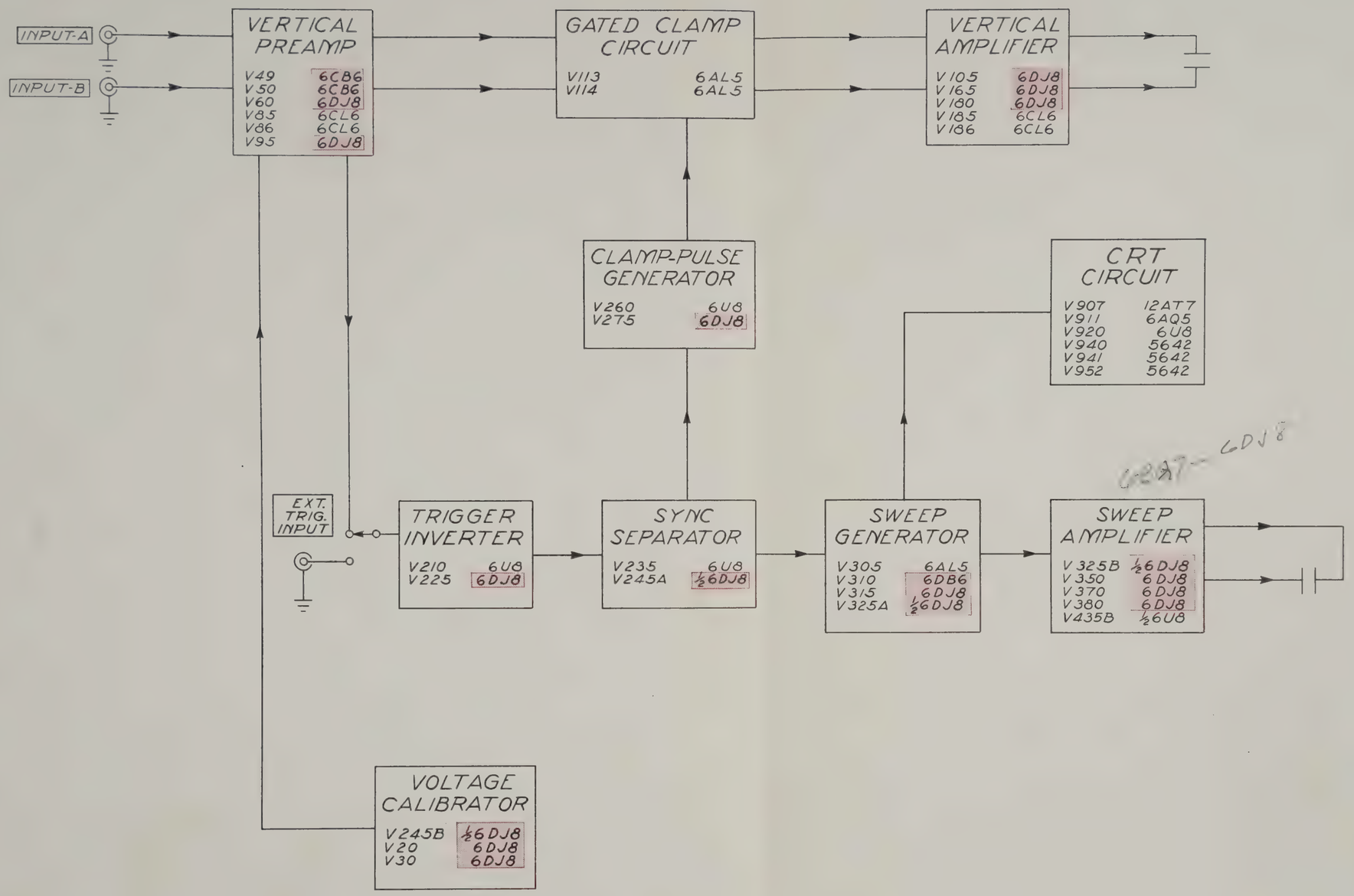
	Tektronix Part Number
CLAMP, CABLE 1" PLASTIC	343-014
CLAMP, 1/2" STAINLESS STEEL SN 101-402	343-015
CLAMP, 5/8" ALUM. (CRT SOCKET)	343-027
CONNECTOR, CHASSIS MNT. 2 CONT. MALE SN 101-417	131-010
CONNECTOR, CHASSIS MNT. 1 CONT. FEMALE	131-012
CONNECTOR, CABLE CLIP ANODE SN 101-240	131-026
CONNECTOR, CABLE 12" ANODE	131-084
CONNECTOR, CHASSIS MNT. 3 WIRE MALE SN 418-up	131-102
COUPLING, INSULATING MOLDED NYLON ASS'Y	376-011
COUPLING, POT	376-014
COVER, ANODE, RUBBER	200-023
COVER, GRATICULE	Use 200-382
COVER, COAX CABLE	200-097
COVER, CRT ANODE & PLATE ASS'Y (200-111 & 386-647)	200-112
FAN, 5 1/2" BLADE	369-001
FASTENER, PAWL RIGHT W/STOP	214-055
FASTENER, PAWL LEFT W/STOP	214-056
FILTER, LIGHT 5" PLEXI	378-514
GRATICULE	331-035
GROMMET, RUBBER 5/16	348-003
GROMMET, RUBBER 3/8	348-004
GROMMET, RUBBER 1/2	348-005
GROMMET, RUBBER 3/4	348-006
HANDLE, PLATED	367-003
HOLDER, FUSE	352-010
JEWEL, LIGHT PILOT RED	378-518
KNOB, SMALL RED 3/16 INSERT HOLE SN 870-up	366-032
KNOB, SMALL BLACK 1/4 INSERT HOLE	366-033
KNOB, SMALL RED 1/8 HOLE PART WAY	366-038
KNOB, SMALL RED 3/16 HOLE PART WAY	366-039
KNOB, LARGE BLACK 17/64 HOLE THRU	366-040
KNOB, LARGE BLACK 1/4 HOLE PART WAY	366-042
KNOB, SMALL BLACK 1/4 HOLE PART WAY	366-044
KNOB, LARGE BLACK 17/64 HOLE TRU	366-046
KNOB, SMALL GREY FOR RETAINING ROD SN 101-167	366-056
KNOB, SMALL GREY .600 x .250 x .468 HI SN 168-up	366-061

	Tektronix Part Number
KNOB, POINTER ASS'Y 366-043 & 331-041	366-520
LOCKWASHER, INT. #4	210-004
LOCKWASHER, EXT. #6	210-005
LOCKWASHER, INT. #6	210-006
LOCKWASHER, EXT. #8	210-007
LOCKWASHER, INT. #8	210-008
LOCKWASHER, EXT. #10	210-009
LOCKWASHER, INT. #10	210-010
LOCKWASHER, POT INT. 3/8 x 1/2	210-012
LOCKWASHER, INT. 3/8 x 11/16	210-013
LUG, SOLDER SE4	210-201
LUG, SOLDER SE6 W/2 WIRE HOLES	210-202
LUG, SOLDER SE 8	210-205
LUG, SOLDER SE10 LONG	210-206
LUG, SOLDER POT PLAIN 3/8	210-207
MOTOR, FAN R/B 147-021 SN 101-407	147-009
MOTOR, FAN SN 408-up	147-021
NUT, HEX 4-40 x 3/16	210-406
NUT, HEX 6-32 x 1/4	210-407
NUT, HEX 8-32 x 5/16	210-409
NUT, HEX 10-32 x 5/16	210-410
NUT, HEX 3/8-32 x 1/2	210-413
NUT, HEX 15/32-32 x 9/16	210-414
NUT, KNURLED GRATICULE	210-424
NUT, HEX 1-72 x 5/32 (REC'D. W/POT)	210-438
NUT, HEX 10-32 x 3/8 x 1/8	210-445
NUT, KEPS 6-32 x 5/16	210-457
NUT, KEPS 8-32 x 11/32	210-458
NUT, SWITCH 12 SIDED	210-473
NUT, HEX 6-32 x 5/16 5-10 W RES. MTNG.	210-478
NUT, 21-32 x 2 1/2 TAPPED 6-32 BOTH ENDS (CRT ROTATOR SECURING)	210-503
NUT, HEX 5/16-24 x 1/2 x 3/16	210-524
NUT, HEX 10-32 x 3/8 x 1/8	210-564
NUT, KEPS STEEL 10-32 x 3/8	220-410
PANEL, FRONT SN 101-167	333-223
PANEL, FRONT SN 168-up	333-268
PANEL, BACK UPPER	333-262
PANEL, BACK LOWER	333-263

	Tektronix Part Number
PLATE, $^{9}/_{16} \times 1\,^{17}/_{32}$ CONNECTING	386-374
PLATE, SUB-PANEL	386-483
PLATE, GLASS LAMINATE $^{1}/_{16}$ COPPER CLAD	386-504
PLATE, LEFT SIDE	387-557
PLATE, RIGHT SIDE	387-558
PLUG, CRT CONTACT SN 241-up	134-031
POST, CONNECTING CERAMIC $^{1}/_{2}$" SN 101-629	129-009
POST, CONNECTING CERAMIC 1" SN 101-629	129-017
POST, BINDING 5 WAY STEM & CAP ASS'Y	129-036
RING, LOCKING SWITCH	354-055
RING, SECURING POLYETH. SN 403-up	354-068
RING, SECURING SN 870-1449	Use 050-063
RING, SECURING SN 1450-up	354-178
RING, CLAMPING	354-103
ROD, EXTENSION $^{1}/_{8} \times 1\,^{13}/_{16}$	384-082
ROD, EXTENSION $^{1}/_{4} \times 10\,^{1}/_{8}$	384-129
ROD SUPPORT POST $^{3}/_{8} \times {}^{3}/_{8} \times 1\,^{17}/_{32}$ TAPPED 6-32 BOTH ENDS SN 101-869	384-529
ROD SUPPORT POST $^{3}/_{8} \times {}^{3}/_{8} \times 1\,^{5}/_{32}$ TAPPED 6-32 BOTH ENDS SN 870-up	384-556
ROD, NYLON, $^{5}/_{16}$ DIA. $\times 1\,^{1}/_{4}$ TAPPED 6-32 ONE END W/2 PINS	385-041
SCREW, 4-40 $\times$ $^{1}/_{4}$ BHS	211-008
SCREW, 4-40 $\times$ $^{5}/_{16}$ BHS	211-011
SCREW, 4-40 $\times$ $^{3}/_{8}$ BHS	211-012
SCREW, 4-40 $\times$ $^{1}/_{2}$ BHS	211-014
SCREW, 4-40 $\times$ $^{5}/_{8}$ RHS	211-016
SCREW, 4-40 $\times$ $^{7}/_{8}$ RHS	211-018
SCREW, 4-40 $\times$ $^{1}/_{4}$ FHS	211-023
SCREW, 4-40 $\times$ $^{3}/_{8}$ FHS	211-025
SCREW, 4-40 $\times$ $^{5}/_{16}$ FHS, PHILLIPS	211-038
SCREW, 6-32 $\times$ $^{3}/_{16}$ BHS	211-503
SCREW, 6-32 $\times$ $^{1}/_{4}$ BHS	211-504
SCREW, 6-32 $\times$ $^{5}/_{16}$ BHS	211-507
SCREW, 6-32 $\times$ $^{3}/_{8}$ BHS	211-510
SCREW, 6-32 $\times$ $^{1}/_{2}$ BHS	211-511
SCREW, 6-32 $\times$ $^{5}/_{8}$ BHS	211-513
SCREW, 6-32 $\times$ $^{5}/_{16}$ PAN HS W/LOCKWASHER	211-534
SCREW, 6-32 $\times$ $^{5}/_{16}$ FHS 100° CSK PHILLIPS	211-538
SCREW, 6-32 $\times$ $^{5}/_{16}$ RHS	211-543

	Tektronix Part Number
SCREW, 6-32 x 3/4 TRUSS HS PHILLIPS	211-544
SCREW, 6-32 x 3/8 FHS 100° CSK PHILLIPS	211-559
SCREW, 6-32 x 1 RHS	211-560
SCREW, 6-32 x 3/8 FH CAP HEX. SOC.	211-561
SCREW, 8-32 x 1 BHS	212-020
SCREW, 8-32 x 3/8 BHS	212-023
SCREW, 8-32 x 3/8 FHS 100° PHILLIPS	212-040
SCREW, 10-32 x 1/2 OHS	212-512
SCREW, 10-32 x 1 1/4 HHS	212-520
SCREW, 10-32 x 5 1/2 HHS	212-540
SCREW, THREAD CUTTING 5-32 x 3/16 PAN HS PHILLIPS	213-044
SCREW, THREAD CUTTING 6-32 x 5/16 PHS SN 1430-up	213-054
SCREW, THREAD CUTTING 6-32 x 5/16 FHS 100° CSK PHILLIPS	213-068
SHIELD, HEAD COAX. CABLE	337-059
SHIELD, H. V.	337-132
SHIELD, CERAMIC STRIP	337-133
SHIELD, 5" GRATICULE LIGHT	337-187
SHIELD, CRT	337-367
SHOCKMOUNT, RUBBER 1/2 x 5/8	348-007
SHOCKMOUNT, RUBBER 1/2 x 1/2	348-008
SLIDE, CHASSIS TRACK LEFT	351-008
SLIDE, CHASSIS TRACK RIGHT	351-009
SOCKET, GRATICULE LAMP	136-001
SOCKET, STM7G	136-008
SOCKET, STM8G	136-011
SOCKET, STM9G	136-015
SOCKET, LIGHT JEWEL DRAKE	136-025
SOCKET, CRT ASSEMBLY	136-115
SPACER, NYLON .063 FOR CERAMIC STRIP	361-007
SPACER, NYLON MOLDED .188 FOR CERAMIC STRIP	361-008
SPACER, NYLON MOLDED .313 FOR CERAMIC STRIP	361-009
STRAP, MOUNTING	346-001
STRIP, FELT 1/8 x 1 x 5 3/4	124-068
STRIP, FELT 3/16 x 1 x 7 1/4	124-069
STRIP, CERAMIC 3/4 x 2 NOTCHES, CLIP MOUNTED	124-086
STRIP, CERAMIC 3/4 x 3 NOTHES, CLIP MOUNTED	124-087
STRIP, CERAMIC 3/4 x 4 NOTCHES, CLIP MOUNTED	124-088
STRIP, CERAMIC 3/4 x 7 NOTCHES, CLIP MOUNTED	124-089
STRIP, CERAMIC 3/4 x 11 NOTCHES, CLIP MOUNTED	124-091
STRIP, CERAMIC 7/16 x 3 NOTCHES, CLIP MOUNTED	124-092

	Tektronix Part Number
STRIP, CERAMIC 7/16 x 5 NOTCHES, CLIP MOUNTED	124-093
STRIP, CERAMIC 3/4 x 1 NOTCHES, CLIP MOUNTED	124-100
STUD, CRT ROTATOR (SN 870-up)	355-049
TAG, VOLTAGE RATING	334-649
WASHER, STEEL 5S x 9/32	210-801
WASHER, STEEL 6L x 3/8	210-803
WASHER, STEEL 10S x 7/16	210-805
WASHER, STEEL 5/16 x 5/8	210-807
WASHER, CENTERING 20W RES.	210-808
WASHER, CENTERING 25W RES.	210-809
WASHER, FIBER #10	210-812
WASHER, RUBBER	210-816
WASHER, STEEL FINISHING #10	210-833
WASHER, STEEL .390 x 9/16	210-840
WASHER, STEEL .119 x 3/8	210-851
WASHER, RUBBER (FOR FUSEHOLDER)	210-873
WASHER, STEEL FLAT .470 x 21/32	210-902
WASHER, WAVY	210-914
WASHER, STEEL .025 x .115 ID x 15/32 OD	210-958



SEE PARTS LIST FOR EARLIER VALUES AND S/N CHANGES OF PARTS MARKED

R.O.W.
3-22-61

TYPE 525 OSCILLOSCOPE

AA

BLOCK DIAGRAM

WAVEFORMS AND VOLTAGE READINGS
WERE TAKEN WITH CONTROLS SET AS FOLLOWS:

VERTICAL GAIN	FULL RIGHT
ATTENUATOR	5X
HORIZONTAL DISPLAY	LINE, INT. TRIG
INPUT SELECTOR	INV
INPUT SIGNAL	COMPOSITE VIDEO
INPUT LEVEL	ADJUST FOR FULL SCREEN DEFLECTION

52¼ VERT. PREAMP

V49 V50 PHASE SPLITTER AMPLIFIERS

V60A V60B CATHODE FOLLOWERS

V85 V86 AMPLIFIERS

V95A V95B OUTPUT CATHODE FOLLOWERS

SIGNAL

SW11A

SW11B

INPUT "B"

INPUT "A"

DIFF.

INV.

NORM.

CAL RANGE

1.5

.5

.15

.05

C10 .1

R10 1M

R11 400K

DC BAL 1st STAGE

R12 2.5K

R14 400K

R8 100K

R13 10K

C13 6.25µf

R15 1M

C15 .1

R1 10

FROM R37 (CALIBRATOR)

+280V

R40 10K

C41A 15µf

L41 6.4µh

R41 1K

+103V

V49 6CB6

R43 220

R44 27

+96V

+250V

R45 8K

VERTICAL GAIN ATTENUATOR

SW49

X1

X2

X5

L46 .75µh

R47 500

R49 680

R48 500

L47 1.4-2.6µh

L49 1.7-3.8µh

R46 8K

R53 220

V50 6CB6

R51 1K

L51 6.4µh

C41B 15µf

R50 10K

+280V

R55 5.6K

C55 6.25µf

V60A ½6DJ8

R57 47

+106V

C59 .1

R64 100K

LF COMP.

R65 2M

R59 27K

DC BAL 2ND STAGE

R69 1.2M

R70 10K

R63 333K

R71 1.2M

R60 27K

R72 100K

C60 .1

R61 47

V60B ½6DJ8

R82 1.2K

R83 1.5K

TO "X"

C83A 15µf

L84 11-19µh

R84 1K

V85 6CL6

C76 .01

R76 100K

R81 27

R77 3K

R78 3K

L80 .79-1.5µh

R80 355

VERTICAL GAIN

R88 1.5K

R79 100K

C79 .01

V86 6CL6

R87 1K

L87 11-19µh

LR86 5.5µh

15

C83B 15µf

R85 1.5K

"X"

V95A ½6DJ8

R93 47

R95 27K

R96 27K

R94 47

V95B ½6DJ8

TO GRID, PIN 2, V10 5A CATHODE FOLLOWER (VERTICAL AMPLIFIER)

TO GRID, PIN 5, V21 0 INTERNAL TRIGGER INVERTER (SYNC SEPARATOR)

TO GRID, PIN 2, V21 0 INTERNAL TRIGGER INVERTER (SYNC SEPARATOR)

TO GRID, PIN 7, 110 5B CATHODE FOLLOWER (VERTICAL AMPLIFIER)

SW5C

SW5D

SW5F

SW5E

INPUT SELECTOR

SW5A,B (CALIBRATOR)

SEE PARTS LIST FOR EARLIER VALUES AND S/N CHANGES OF PARTS MARKED

R.O.W. 3-22-61

(SHOCK MOUNTED CHASSIS)

VERTICAL PREAMP

TYPE 525 TELEVISION WAVEFORM MONITOR

AB

V105A
V105B
CATHODE FOLLOWERS

V113
V114
GATED
CLAMP DIODES

WAVEFORMS AND VOLTAGE READINGS
WERE TAKEN WITH CONTROLS SET AS FOLLOWS:
VERTICAL RESPONSE . . . FLAT
DC RESTORER . . . . . ON
FOR SETTINGS OF OTHER CONTROLS
SEE VERTICAL PREAMP DIAGRAM
525 VERT AMP

V165B
V165A
HIGH-PASS
AMPLIFIERS

V180A
V180B
CATHODE FOLLOWERS

V185
V186
OUTPUT
AMPLIFIERS

SW140A
SW140E
IRE
FLAT
LOW PASS
HI PASS
R145 130K
L145 000
C145 130
C105 .01
R151 820
R153 8.2K
C151 100
R175 2.2M
SW140C
SW140D
SW140B
SW140F
SW140G (CALIBRATOR)
VERTICAL RESPONSE
C154 470
C152 100
R152 820
R154 8.2K
R146 1.28K
L146 1.30μH
C146 130

V180A ½6DJ8
+280V
R177 47
R190 470
L191 50-70μH
TO 'Y' BELOW
R191 2.5K
+198V
TO TOP DEFLECTION PLATE (D3)

V186 6CL6
+95V
R185 47
R133 220K
C193 .01
R181 15K
R187 3K
R189 200
VERTICAL GAIN SET
R188 3K
R196 5.6K
+210V
R182 15K
R186 47
R194 100K
C194 .01
V185 6CL6
+196V
TO BOTTOM DEFLECTION PLATE (D4)
R192 2.5K
"Y"

V180B ½6DJ8
R178 47
+15V
0

V105A ½6DJ8
FROM SW5 INPUT SELECTOR (VERTICAL PREAMP)
R103 47
R105 10K
R106 10K
V105B ½6DJ8
R104 47

TO 'X' BELOW
R111 4.7M
V113B ½6AL5
V113A ½6AL5
C119 .02
R119 2.2M
R121 2.2M
C121 .02
LINE-RATE CLAMP-PULSE FROM PLATE, PIN 6, V275B CLAMP-PULSE PHASE SPLITTER (SYNC SEPARATOR)
R113 6.8M
+280V
OFF
ON
R114 6.8M
LINE-RATE CLAMP-PULSE FROM CATH, PIN 8, V275B CLAMP-PULSE PHASE SPLITTER (SYNC SEPARATOR)
C122 .02
R122 2.2M
V114A ½6AL5
V114B ½6AL5
R120 2.2M
C120 .02
"X"
R112 4.7M
OFF
ON
TO CATH, PIN 7, V260A CLAMP-PULSE SHAPER (SYNC SEPARATOR)
C106 .01

VERNIER
R132 78K
R131 5K
R133 68K
+120V
R134 6.8K
R135 10K
VERTICAL POSITION
R136 5.6K
R137 5K
VERT. POS. RANGE
C157 47
R156 22K
C156 51
C158 8-50
L158 60μh

V165B ½6DJ8
+280V
R167 4.7K
+231V
C153 47
R165 47
L163 28-50μh
HI PASS GAIN ADJ.
R161 1K
R162 1K
+120V
+121V
R172 12K
R171 10K
R173 12K
R169 22K
V165A ½6DJ8
R166 47
C168 47
+232V
R168 4.7K
+280V
C176 .001
C175 .02

SW120B
SW120A
SW120C
SW120D
DC REST.

SEE PARTS LIST FOR EARLIER VALUES AND S/N CHANGES OF PARTS MARKED WITH RED TINT BLOCKS

R.O.W.
9-22-61

TYPE 525 TELEVISION WAVEFORM MONITOR

AC

VERTICAL AMPLIFIER

V235A
SYNC SEPARATOR

V235B
CLAMP DIODE

V245A
CATHODE FOLLOWER

V210
INTERNAL TRIGGER INVERTER

V225
EXTERNAL TRIGGER INVERTER

COMPOSITE VIDEO

+60V
0
-60V
2MSEC

+120V
+280V
+131V
+199V
+123V
+143V
+209V
+68V
+259V
+270V
+246V
+22V
+72V
+187V
+188V
+15V
-15V

V235B ½6U8
R235 68K
R236 10K
C235 22
R238 18K
R239 10K
C240 .01
C241 .01
C238 .01
C239 .01
R241 1M
V241 T12G
R242 470K
R244 47
V245A ½6DJ8
C245 .1
R245 100K

+30V
-30V
2MSEC

SYNC PULSES
SYNC PULSE TRIGGER SIGNAL TO PIN 5, V305A (SWEEP)
INTEGRATED VERTICAL SYNC PULSE

COMPOSITE SIGNAL FROM SW5 INPUT SELECTOR (VERTICAL PREAMP)

V210A ½6U8
R208 2.2M
R201 47
C201 0.01

HORIZONTAL DISPLAY
SW230C (SWEEP)
SW230B
SW230A

V210B ½6U8
R202 47
C202 0.01
R203 2.2M
R211 56K
C211 6.25µf
R212 1.8M
R213 2.2M
INT. TRIG.
EXT. TRIG.
LINE
FIELD

SW220
TRIGGER POLARITY
EXT. TRIG. INPUT
R223 1M

C221 0.01
R221 47
C224 6.25
R224 12K
R228 6.8K
R220 2.2M
R226 51K
R227 56K
R225 2.2M
C222 0.01
R222 47
V225B ½6DJ8
V225A ½6DJ8

R218 12K

V260B
CLAMP-PULSE PICKOFF

V260B ½6U8
R259 10K
R255 100K
R256 100K
V264 T12G
C264 .01
C259 3-50
C255 .001

V260A
CLAMP-PULSE SHAPER

R264 3.9K
R267 47K
R265 1M
R266 47
V260A ½6U8
R268 4.7K

V275B
CLAMP-PULSE PHASE SPLITTER

V275A
CLAMP-PULSE SHAPER DIODE

V275B ½6DJ8
R275 10K
R276 10K
R277 10K
R278 68K
+35V
+33V

LINE RATE CLAMP-PULSE TO GATED CLAMP DIODES V113, V114 (VERTICAL AMPLIFIER)

V275A ½6DJ8
C268B 20µf

R230 470K
R234 2.7M
R231 12K
R232 22M
C230 470
R233 47
R258 180K
V235A ½6U8

R230 6MK
C231 .01
C230 270
2/11,146-177

TAKEN WITH 2.5µµf PROBE (50X OR 100X)

OFF
ON
SW120A
DC REST.
IN VERTICAL AMP. DIAGRAM

WAVEFORMS AND VOLTAGE READINGS
WERE TAKEN WITH CONTROLS SET AS FOLLOWS:
DC RESTORER ... ON
*HORIZONTAL DISPLAY ... LINE, INT. TRIG.
*USE FIELD POSITION FOR WAVEFORMS MARKED WITH ASTERISK.
FOR SETTINGS OF OTHER CONTROLS SEE VERTICAL PREAMP DIAGRAM
525 SYNC SEP
AA

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SEE PARTS LIST FOR EARLIER VALUES AND S/N CHANGES OF PARTS MARKED WITH RED TINT BLOCKS

SYNC SEPARATOR AND TRIGGER AMPLIFIER

V305A
DISCONNECT DIODE

V310
PHANTASTRON
SWEEP GENERATOR

V325B
SWEEP-GENERATOR
CATHODE FOLLOWER

V325A
V435B
CATHODE FOLLOWERS

V350A
V350B
AMPLIFIERS

V370B
V370A
CATHODE FOLLOWERS

V380A
V380B
OUTPUT AMPLIFIERS

V315A
V305B
V320
CLAMP DIODES

V315B
UNBLANKING
CATHODE FOLLOWER

+300V
+150V
0
2MSEC

+300V
+150V
0
50MSEC

+300V
+150V
0
2MSEC

+300V
+150V
0
50MSEC

V305A
½6AL5

TRIGGER IN
FROM CATH, PIN 3, V245A
CATHODE FOLLOWER
(SYNC SEPARATOR)

+280V
R310 270K
R309 33K
C309 47
R306 56K
R305 5.6M
+110V
+115V
-4.3V

V310
6DB6

V315A
½6DJ8

R312 47
V325B
½6DJ8
+122V
R325 22K
C325 390
R326 10K
R321 183K
R327 82K
R320 50M
+120V
HORIZONTAL RATE
R319 20K
R318 4.7K
LINE
FIELD
INT. TRIG.
FIELD
LINE
EXT. TRIG.
SW230C
HORIZONTAL DISPLAY
SW 230A, SW230B (SYNC. SEP. & TRIG. AMP.)

C307 470
R307 470K

+280V
HORIZONTAL POSITION
R334 15K
R335 100K
R331 400K
R332 200K
R330 100K
C332 4.5-25
HORIZONTAL GAIN SET
+120V

+280V
VERNIER
R338 100K
R337 10M
R339 47
V325A
½6DJ8
+120V
+124V

R341 100K
R342 220K

+280V
R353 12K
+240V
V350A
½6DJ8
R351 47
+126V
+46V
R345 56.5K PREC.
R346 6K PREC.
1x
5x
25x
MAGNIFIER
SW350
R347 1K
MAG.CAL ADJ.
R355 33K
MAG. CENTERING
R370 10K
C370 27
R356 33K
R368 33K
R365 120K
+120V
V370A
½6DJ8
+51V
R367 33K
R373 47K
R374 47K
+280V
R381 47K
+177V
TO D1
LEFT HAND
DEFLECTION PLATE
V380B
½6DJ8
+54V
R380 12K
+51V
+173V
TO D2
RIGHT HAND
DEFLECTION PLATE
V380A
½6DJ8
R382 47K
+280V

+120V
+125V
R352 10K
C352 .02
V435B
½6U8
+280V

+126V
V350B
½6DJ8
+46V
+240V
R366 120K
R354 18K
+280V

V370B
½6DJ8
+120V

D320
V321
+120V

-4.8V
C315 .047
R315 47K
V305B
½6AL5
R317 10K

UNBLANKING PULSE
TO GRID, PIN 3, OF CRT
VIA C955 (CRT CIRCUIT)

120V
60V
0
2MSEC

120V
60V
0
50MSEC

WAVEFORMS AND VOLTAGE READINGS
WERE TAKEN WITH CONTROLS SET AS FOLLOWS:
*HORIZONTAL DISPLAY .....LINE, INT. TRIG.
*USE FIELD POSITION FOR WAVEFORMS MARKED WITH ASTERISK.
525 SWEEP

SEE PARTS LIST FOR EARLIER VALUES AND S/N CHANGES OF PARTS MARKED WITH RED TINT BLOCKS

TYPE 525 TELEVISION WAVEFORM MONITOR

AB

SWEEP

R.O.W.
3-20-61

WAVEFORMS AND VOLTAGE READINGS
WERE TAKEN WITH CONTROLS SET AS FOLLOWS:
INPUT SELECTOR .....1.5 V CAL. RANGE
525 CAL.

V20A
GROUNDED-GRID AMPLIFIER

V245B ½6DJ8
V20B ½6DJ8
CALIBRATOR MULTIVIBRATOR

V30A
CALIBRATOR CLAMP

V30B
CALIBRATOR C.F.

+300V
0
-300V
0
200μSEC

+280V
HI-PASS
LO-PASS
FLAT
IRE
VERTICAL RESPONSE
SW140 A,B,C,D,E,F (VERTICAL AMP.)
SW140G
SW5A
INPUT SELECTOR
SW5C,D,E,F (VERTICAL PREAMP)

R23 82K
+195V
C23 .01
R25 4.7M
R35 47K
+56V
R36 100K
V30B ½6DJ8
6
7
8
TO SW5C (VERTICAL PREAMP)
SW5B
INV.
NORM.
R37 5K
AMPLITUDE CALIBRATOR
+59V
C36 39
R30 9847
1.5V
R31 102.9
.5V
R32 35.33
.15V
R33 10.03
.05V
R34 5.004
R38 10K
R39 SELECTED VALUE
CAL. SCALE ADJ. (FACTORY ADJUSTED)

R24 300K
+120V
+120V
R22 47
V20A ½6DJ8
1
2
3
+122V
R21 39K
+83V
V30A ½6DJ8
+99V
+280V
R27 40K
CAL. ADJ.
R28 5K
R29 20K
C28 .01

R18 82K
+106V
C18 22
C21 22
R19 2.2M
R20 2.2M
V245B ½6DJ8
-10V
V20B ½6DJ8
-43V

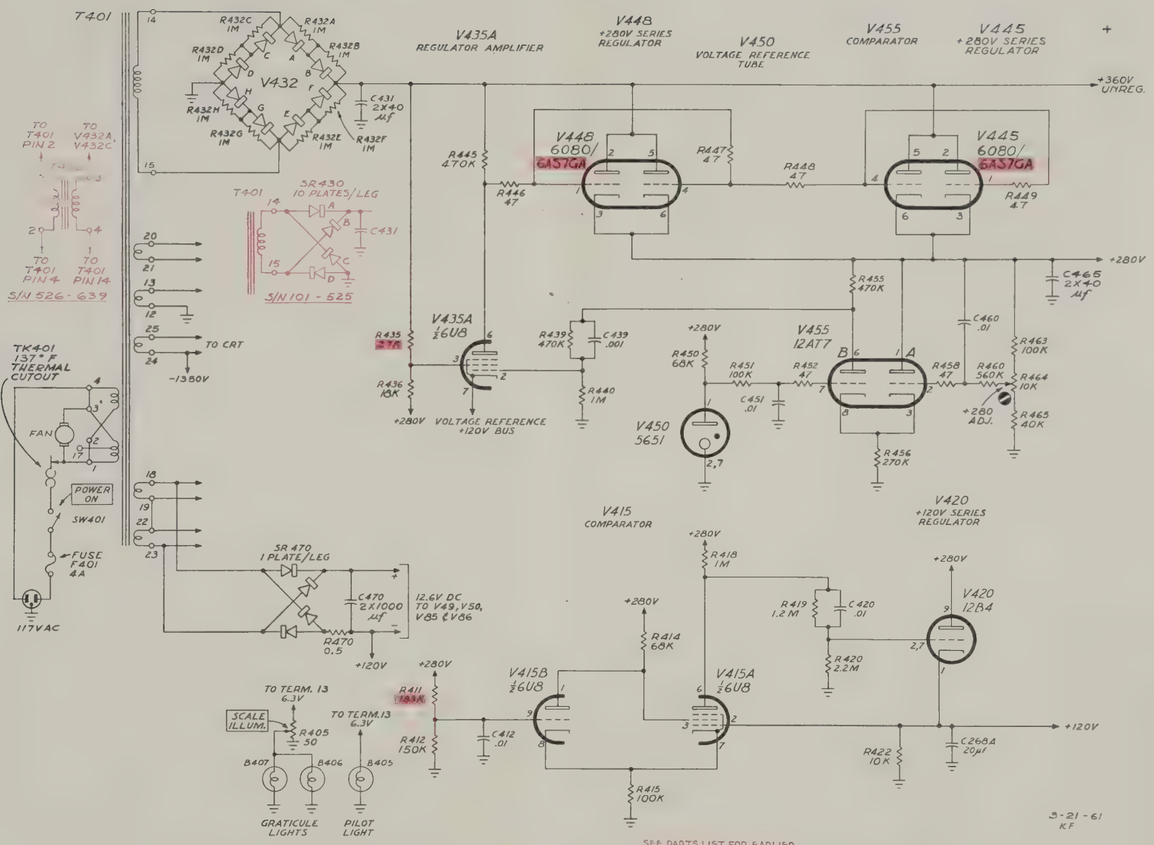
SEE PARTS LIST FOR EARLIER VALUES AND S/N CHANGES OF PARTS MARKED

TYPE 525 TELEVISION WAVEFORM MONITOR

AA

CALIBRATOR

R.O.W.
3-21-61

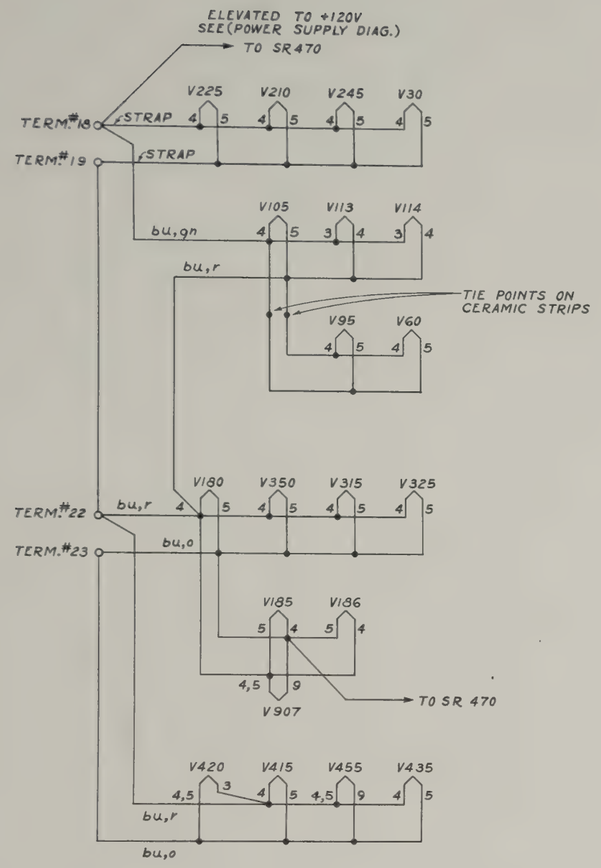


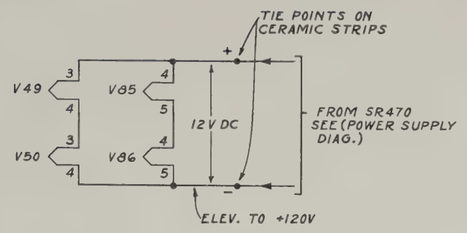
TYPE 525 TELEVISION WAVEFORM MONITOR

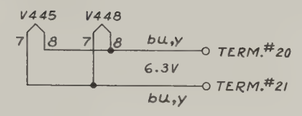
AB

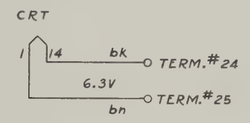
SEE PARTS LIST FOR EARLIER VALUES AND S/N CHANGES OF PARTS MARKED WITH RED TINT BLOCKS

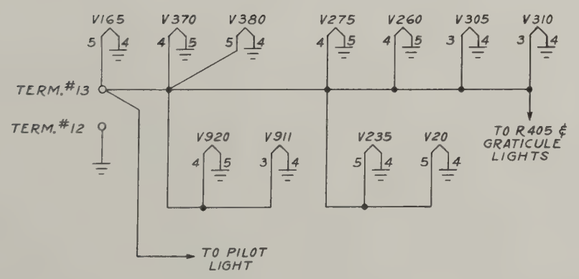
LV POWER SUPPLY
EFF. S/N 101 - 1549

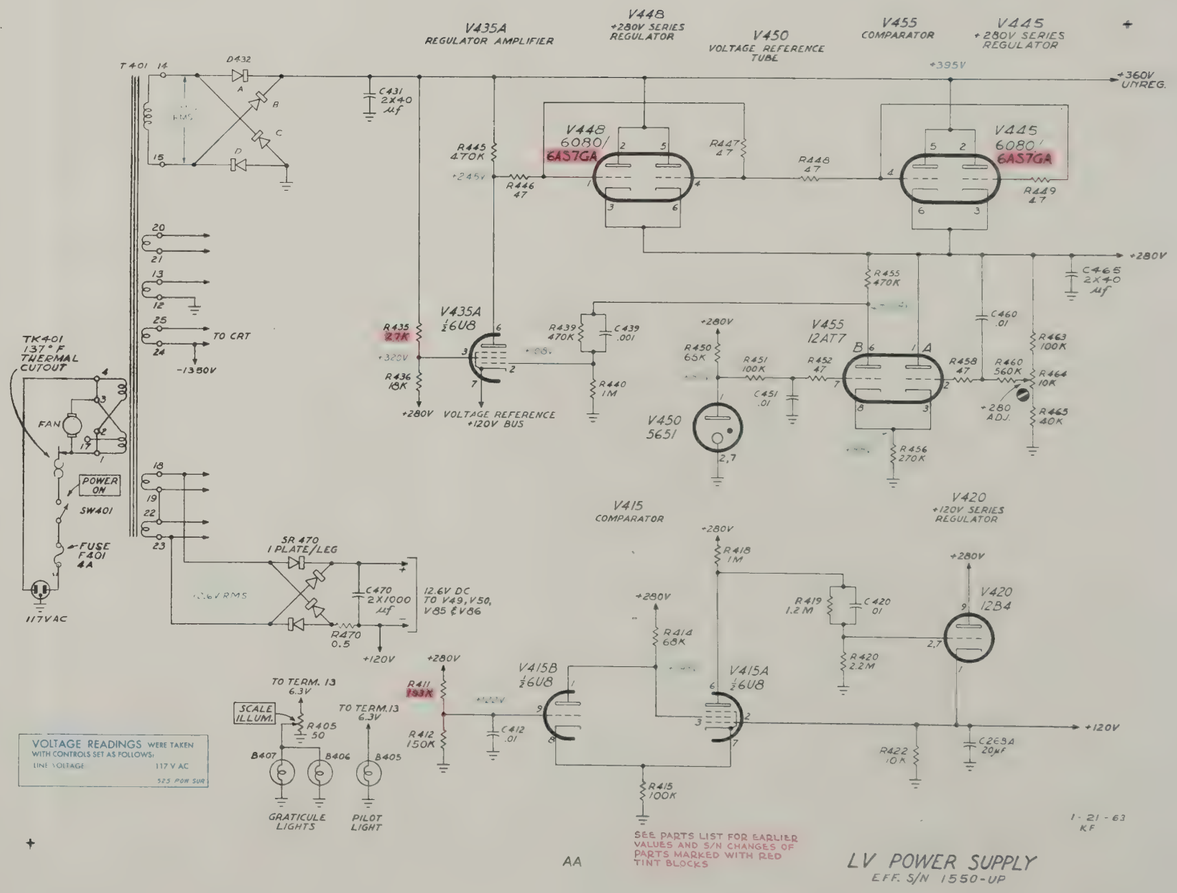












3-22-61
R.O.W.

TYPE 525 TELEVISION WAVEFORM MONITOR

HEATER WIRING DIAGRAM

LV POWER SUPPLY
EFF. S/N 1550-UP

V907B
REGULATOR
CATHODE-FOLLOWER

V911
OSCILLATOR

T940

UNBLANKING
FROM CATH, PIN 8, V315B
UNBLANKING CATHODE-FOLLOWER
(SWEEP)

VOLTAGE READINGS WERE TAKEN
WITH CONTROLS SET AS FOLLOWS
LINE VOLTAGE ..... 117 V AC

+280V
R906 470K
R907 47
+143V
V907B ½ 12AT7
6
7
8
+280V
C916 180
C915 9-180
+395V
V911 6AQ5
5
6
1,7
2
+150V
C907 .001
R914 1.5K
C911 .001
-54V
R911 47K
C914 .001
UNREG. +DC
V952 5642
C952 .01
-1425V
R955 100K
R954 4.7M
R953 4.7M
R952 1M
R956 1.5M
C955 .01
INTENSITY
A3
+2950V
R942 22M
R943 22M
R944 22M
T52P1 CRT
V959
ASTIGMATISM
GEOM. ADJ.
+280V
R961 100K
A2
+120V
+280V
R960 100K
C960 .001
TO V952
TO V940
TO V941
V920
COMPARATOR
+280V
-1350V ADJ.
UNREG. +DC
R931 1M
R921 10M
+120V
V920A ½ 6U8
6
2
3
7
+120V
V920B ½ 6U8
1
9
8
C922 1μf
R922 10M
R929 1.8M
C929 .0047
+3.V
+7.V
R920 4.7K
C924 .01
R923 3.3M
R924 3.3M
R925 3.3M
V940 5642
R940 4.7K
C945 .0068
V941 5642
R946 1K
C946 .01
C947 .01
+120V
R941 10K
C941 .022
R965 2.2M
R966 2.2M
FOCUS
R967 2M
R968 680K
5
9
3
2
C960 .001
R970 10K
C970 .01
R971 1M
CRT CATH.
GND.

SEE PARTS LIST FOR EARLIER VALUES AND S/N CHANGES OF PARTS MARKED

+ TYPE 525 TELEVISION WAVEFORM MONITOR AA1 CRT CIRCUIT 3-20-61 R.O.W.

MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages. If it does not, your manual is correct as printed.

modification instructions

MI - 050-0268-00

Type 525

HV TRANSFORMER REPLACEMENT

For Tektronix Type 525 Television Waveform Monitor
All Serial Numbers

High voltage transformer, PN 120-0077-00, and a 390Ω 2W 10% resistor, PN 306-0391-00, replace the high voltage transformer, PN 120-0077-00.

The resistor is added between the transformer and the +360V unregulated power supply to limit current through the transformer at high line voltage.

NOTE: If this kit has been installed, disregard the instructions as PN 120-0077-00 is a direct replacement.

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10-21-68
Supersedes: December 1965

4-7-69

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
1 ea	120-0077-00	Transformer, high voltage
1 ea	124-0100-00	Strip, ceramic, 3/4 x 1-notch
1 ea	214-0210-00	Spool, w/3 ft. silver-bearing solder
1 ea	306-0391-00	Resistor, comp, 390Ω 2W 10%
1 ea	361-0007-00	Spacer, nylon molded, 0.063
1 ea	(1-910D)	Tag, MODIFIED INSTRUMENT, gummed back

INSTRUCTIONS

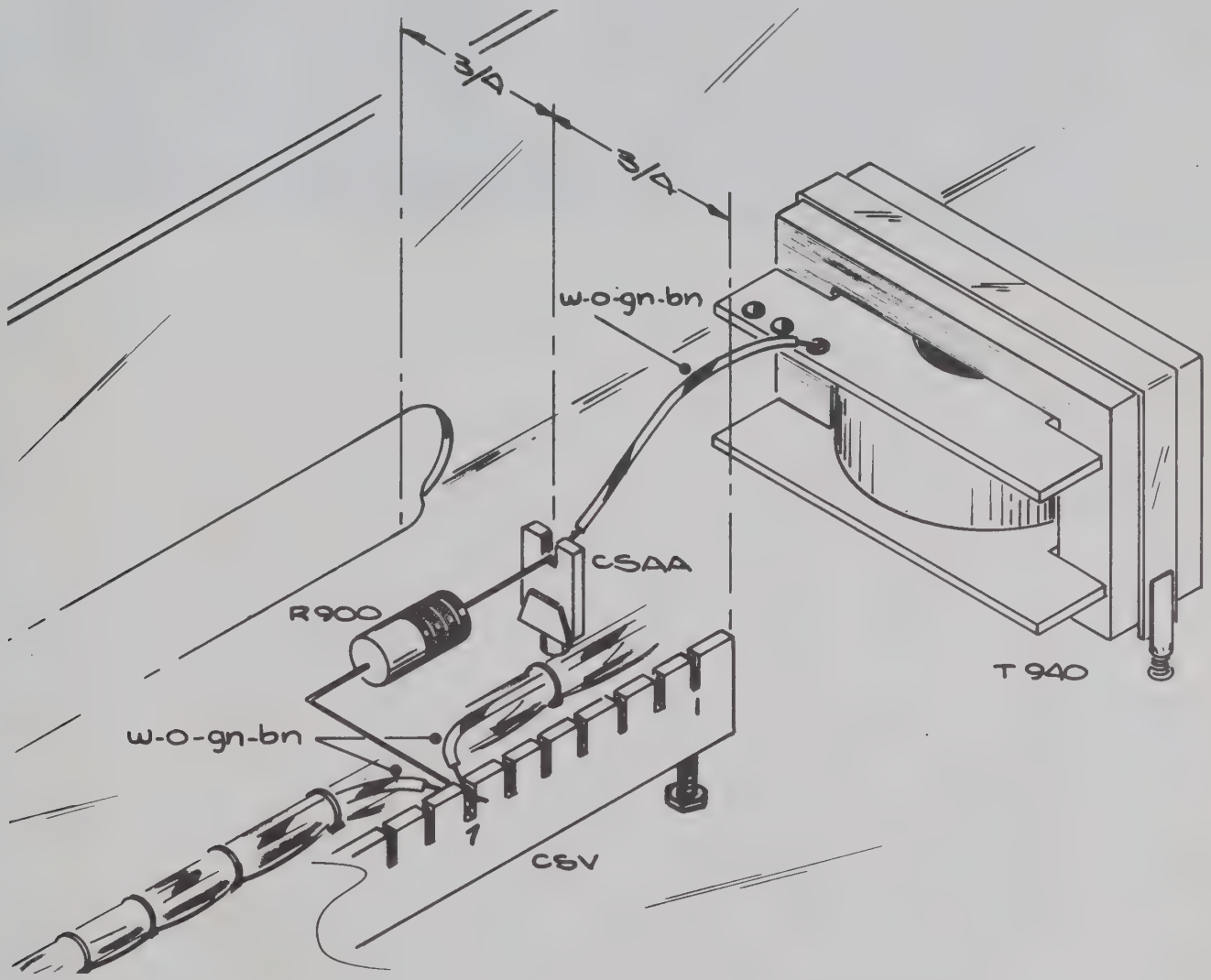
( ) 1. Drill a 5/32" ceramic strip mounting hole as shown in the drawing.

( ) 2. Install a 1-notch ceramic strip, using the nylong molded spacer from the kit. The new ceramic strip will be designated as CSAA.

( ) 3. Locate the white-orange-green-brown wire that connects T940 to CSV-7, and re-locate from CSV-7 to CSAA-1.

( ) 4. Install R900, a 390Ω 2W 10% resistor, between CSB-7 and CSAA-1.

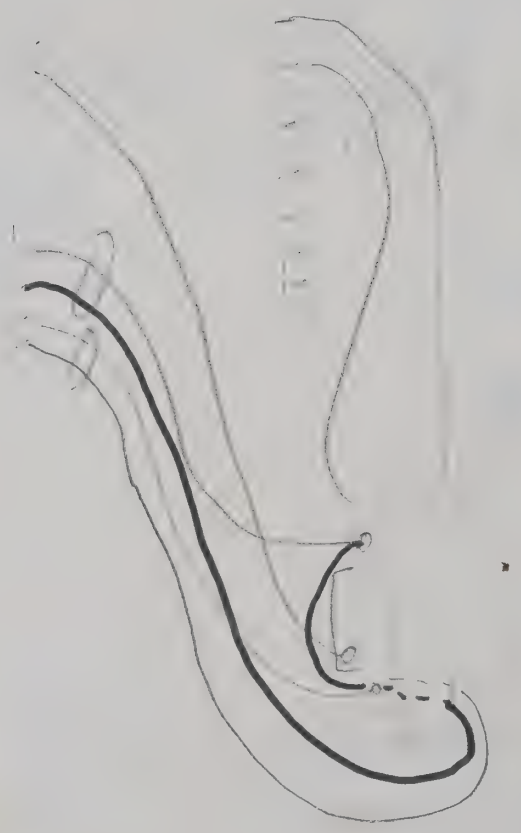
( ) 5. Replace T940, the high voltage transformer, with the new transformer from the kit. The new transformer is a direct replacement.



THIS COMPLETES THE INSTALLATION.

( ) Check wiring for accuracy.

( ) For future reference, correct your Instruction Manual schematic and Electrical and Mechanical Parts Lists as required.

( ) Moisten the back of the MODIFIED INSTRUMENT tag (from kit) and place it on the Manual schematic page affected by this modification.

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